METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

Parking Access and Revenue Control System (PARCS) Technical Specification for Washington Dulles International Airport



Metropolitan Washington Airports Authority
(Airports Authority)

PARKING ACCESS AND REVENUE CONTROL SYSTEM
TECHNICAL SPECIFICATION

June 2015

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

CONTENTS

1 INTRODUCTION TO TECHNICAL SPECIFICATION DOCUMENT

1.1 Introduction

A The Metropolitan Washington Airports Authority (MWAA) is the owner of all parking operations associated with this contract including systems at Washington Dulles International Airport (IAD) and Ronald Reagan Washington National Airport (DCA). Existing revenue parking areas include parking garages (daily at IAD and hourly/daily at DCA), economy surface long-term lots, hourly surface parking at IAD, and valet at IAD. Additionally, non-revenue lots include crew, employee, and other access control lots.

1.2 Technical Specification Organization

A Section 2 – Definitions and Abbreviations.

B Section 3 – Current Conditions: an overview of the IAD airport parking facilities and PARCS applications/environments used for both MWAA airports.

C Section 4 - General Scope of Work: provides a summary of the new PARCS scope, future PARCS requirements including the uPARCS unified solution, as well as administrative project requirements. Also identifies items provided by the Airports Authority and by the Contractor.

D Section 5 – Central Data Management System: technical requirements of the PARCS architecture, servers, workstations, network, database, data storage, data backup and archiving, software, security and administration, status monitoring, and offline requirements.

E Section 6 - System Integrations and Interfaces: identifies the integration and interface requirements.

F Section 7 – Payment Processing: defines processing for PARCS payment forms as well as adjustments and settlements.

G Section 8 – Revenue Management Software Application: defines general requirements such as rate structure as well as virtual tickets, remote cashiering, discounts, exception transactions, customer transaction history, and input fields to replace paper forms.

H Section 9 – Valet System: defines the software and hardware requirements for the IAD valet operation.

I Section 10 – License Plate Recognition Software: defines the LPR software application used at entry lanes, exit lanes, and review workstations.

J Section 11 – Mobile License Plate Recognition Software: defines the MLPI software application used to support customer vehicle location and entry date for lost/unreadable tickets should the LPR not have this information.

K Section 12 – Facility Monitoring System: defines equipment monitoring, system alarms, equipment activation functionality, and event log, which records all system events.

L Section 13 - Access Credential Management System: defines the credential management system that is currently used for employee permit parking but can also be used on pay-per-use for public programs. System includes

account administration, auto payments using a bankcard on file, and an invoicing package.

M Section 14 – Pre-Booking Reservation System: provides an online reservation system that includes demand based variable pricing and yield management tools which interface with PARCS.

N Section 15 – Space Count System: provides facility space counts by facility area, floor, and sub-facility area and interface with local signage, the IAD website, and a mobile app.

O Section 16 – Customer Loyalty Program: provides the ability to offer incentives to registered customers.

P Section 17 – PARCS Reports: provides report tool, data filters/queries/exports and standard reports.

Q Section 18– PARCS Equipment: technical requirements for each piece of PARCS equipment. The installation location of the equipment is located in the Equipment Matrix in the Appendix.

R Section 19- General, Standards, and Compliance: This section identifies general standards and compliance requirements.

S Section 20 - Project Management Support: includes tasks required to manage and installation such as project management, quality assurance, design reviews, testing, training, and documentation requirements.

T Section 21- Contractor's Quality Assurance Program: Project Quality Management includes processes and activities that determine quality policies, objectives, and responsibilities so the project will satisfy the needs for which it is being undertaken.

U Section 22 – Warranty Services: defines the warranty coverage and response times for the first year.

V Section 23 – Post Warranty Preventative Maintenance and Repairs: defines the PM and repair coverage and response times with optional contract extension periods.

W Section 24 – Equipment Performance Standards: Defines minimum performance levels for various systems components, activities and operations.

X Appendix A - E

2 DEFINITIONS & ABBREVIATIONS

2.1 Definitions

Wherever in these contract documents the following terms and abbreviations are used, the intent and meaning shall be interpreted as follows:

A AIRPORT IDENTIFICATION MEDIA - Identification badge issued by the Airports Authority.

B AUTOMATED VEHICLE IDENTIFICATION – An automated vehicle identification technology whereby a vehicle transponder is read by an antenna for access and billing purposes.

C AUTOMOBILE DECAL – Airports Authority issued emblem displayed on vehicle.

D BACKOUT - The detection of a vehicle backing out of an entry lane after a ticket is dispensed but not pulled. After the vehicle backs out, the ticket is retracted.

E BANKCARD – A credit, debit or prepaid card issued by a bank or financial institution.

F BOOTH TRANSACTION PANEL – Mounted outside on a cashier booth and processes regular transactions, automated validations, and bankcard payments. Cannot process exception transactions, manual validations, and cash/check payments.

G CASHIER STATION – Equipment in the exit lane cashier booth that processes all transactions that can be processed at an Exit Station and processes exception transactions, manual validations, and cash/check/bankcard payments.

H CENTRAL CASHIER STATION – Equipment with same functionality as a Cashier Station except that it is not in an exit lane and does not have a barrier gate. Central Cashier Stations are used in the valet operation at Dulles Airport.

I CHASER COUPON – A paper ticket that is printed/encoded with a full or partial parking fee discount by the PARCS Discount Production Device. The chaser coupon is inserted into the POF Station, Cashier Station Booth Transaction Panel, or Exit Station and PARCS reads the discount on the chaser coupon and applies it to the parking fee.

J CHIP & PIN BANKCARDS – Another term for EMV Bankcards.

K COMMENT – Written critiques of the Contractor’s submittals to the Contracting Officer.

L COMMERCIAL LANES – Collectively these are the exterior traffic lanes on the ground level of the Terminal Building located immediately north and south of Level I of the Terminal Building utilized for commercial passenger vehicle traffic.

M COMPONENT – Any device or functional application having distinct electrical or mechanical characteristics and having connection points to be connected to other components to form a subassembly.

N CONSUMER PRICE INDEX - A consumer price index measures changes in the price level of consumer goods and services purchased

by households. The CPI in the United States is defined by the Bureau of Labor Statistics as "a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services".

O EMV BANKCARD - A credit, debit or prepaid card issued by a bank or financial institution that contains a smart card chip with a contact interface and is compliant with the EMV standard. The smart card chip has exposed contacts that shall make physical connection with contact points in a card reader for proper processing of the card.

P CONTACTLESS BANKCARD - An ISO/IEC 14443 compliant contactless card of the same dimensions as a standard bankcard, issued by a financial institution. The contactless card includes a microprocessor executing specialized application software, Non-Volatile Random Access Memory, Read Only Memory, and a radio frequency interface. A digital version of a CONTACTLESS BANKCARD may also be stored on a customer's smart phone.

Q CONTINUING CONTRACTOR - Virginia licensed General Contractor under separate Airports Authority contract retained to furnish materials and/or perform services as defined by the Airports Authority for work, which shall not be included in the PARCS Contractor's scope due to Virginia statutes.

R CONTRACT DELIVERABLES REQUIREMENT LIST – Items to be provided by the Contractor to the Contracting Officer as defined by these contract documents.

S CONTRACT DRAWINGS – Drawings provided as part of the contract documents.

T CONTRACT PERIOD – The Construction contract period commences at Notice to Proceed (NTP) and continues through Final Acceptance. The Maintenance contract period commences at Final Acceptance.

U CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE – The Metropolitan Washington Airports Authority's (Airports Authority) employee designated to coordinate all activities between Contractor and the Airports Authority.

V CONTRACTING OFFICER – The individual designated by the Airports Authority responsible for administering and managing this contract.

W CONTRACTOR – The successful Bidder selected for this RFP for vendors for a replacement parking access and revenue control system.

X CREDENTIAL – An access media that is registered to an individual and managed by the PARCS system. See section on Access Credential Management System.

Y CUSTOMER RELATIONSHIP MANAGEMENT – The Airports Authority solution for managing interactions with current and future airport customers.

Z DISCOUNT – A reduction in the parking Fee or a special rate. The term discounts also includes validations and promotions.

AA DAYS – Unless otherwise designated, days as used in the contract documents shall be understood to mean calendar days.

BB DESIGNATED PARKING OPERATIONS – The Parking facilities located and utilized at Dulles Airport exclusively for Public Parking that are included in the Scope of Work herein.

CC DULLES AIRPORT – The Dulles Airport is situated in Loudoun and Fairfax Counties, State of Virginia, known as Washington Dulles International Airport comprises a terminal complex at the Dulles Airport, including a central landside terminal. The Dulles Airport provides covered and open parking facilities for the use of the traveling public.

DD ENTRY MEDIA – Means by which a customer enters a parking facility such as a paper ticket, bankcard, license plate, QR code (paper or smart phone), or access credential.

EE EUROPAY/MASTERCARD/VISA (EMV) - A security framework that defines the payment interaction at the physical, electrical, data and application levels between chip bankcards and payment devices. These interactions are often referred to as EMV Level 1 and 2 requirements.

FF EXCEPTION TRANSACTION – This is any transaction other than a normal parking transaction that requires human intervention to process, including but not limited to a stolen ticket, lost ticket, Insufficient Fund transaction, unreadable ticket/bankcard/QR code, and validations.

GG EXIT STATION – An unstaffed device in an exit lane that processes tickets, bankcard payments, and automated validation.

HH EXTRACT TRANSFORM LOAD (ETL) – The Airports Authority's data extraction tool used to import Airport Authority owned data into the Airport Authority's data warehouse.

II EZPASS – The tolling program for the Dulles Toll Road (Virginia Route 267) that provides local access to interchanges between the Capital Beltway (I-495) and Dulles Airport.

JJ FAILURE – The inability of a component or equipment to function or perform its intended function as designed or specified.

KK METROPOLITAN WASHINGTON AIRPORTS AUTHORITY (Airports Authority) – Refers to the organization that manages and operates the Dulles Airport.

LL INDEPENDENT FAILURE – A failure that is not the result of another failure, either directly or indirectly.

MM INTERFACE – A bridge, an interface is where two or more separate software products communicate under limited capacity. Data is maintained in multiple locations; thus, requiring more administration.

NN INTEGRATE – A fully integrated system means that the products are one. This happens when two or more products work closely together to combine different functionalities into one product. The data is maintained in one location.

OO LICENSE PLATE INVENTORY – Daily input of license plates into handheld units that record the date, plate number and state, and parking space location of each vehicle. The handhelds are uploaded

into the LPI database and used to find entry date for lost, stolen, or unreadable exception transactions.

PP LOWEST LEVEL REPLACEABLE UNIT – The lowest unit (component) of a system or subsystem that is removable and replaceable from an installed position by standard attachments (e.g., bolts and nuts, quick disconnects, units such as printed circuit boards, displays, keypads, wiring harnesses, and complete electromechanical assemblies sold by the Contractor or Original Equipment Manufacturer (OEM) suppliers as spare parts, etc.). Printed circuit boards shall always be considered LLRUs. Other LLRUs include as units such as displays, keypads, wiring harnesses, and complete electromechanical assemblies as sold by the Contractor or suppliers as spare parts.

QQ MAINTAINABILITY – The ease of the PARCS and its constituent components, subcomponents to be maintained by properly trained maintenance staff.

RR MEAN TIME BETWEEN FAILURES – The mean operating time interval between successive independent failures.

SS MOBILE DEVICE – A smart phone (also known as a handheld device, handheld computer or simply handheld) is a small, hand-held computing device, typically having a display screen with touch input and/or a miniature keyboard. Smart phones and tablets are common examples. A handheld computing device has an operating system (OS), and can run various types of application software, known as apps.

TT MOBILE LICENSE PLATE INVENTORY - License plate inventory taken using cameras mounted on a vehicle with Optical Character Recognition (OCR) software to capture license plate information instead of entering plate data in handheld units.

UU NEAR-FIELD COMMUNICATIONS – Wireless technology based on ISO/IEC 18092, the international standard for short-range wireless standard that uses magnetic field induction to enable communication between devices when they are brought close together (within 10-20 centimeters or 4-8 inches). NFC technology is compatible with ISO/IEC 14443-based technology.

VV NOTICE TO PROCEED – The contractual start date.

WW PAPER TICKET – A machine-readable paper document issued to transient customers upon entrance to a parking facility.

XX PARKING ACCESS AND REVENUE CONTROL SYSTEM (PARCS) – The term Parking Access & Revenue Control System (PARCS) means a real time computerized parking system for transient and credential customers as fully defined within the Technical Specifications including all additions, deletions and changes to all systems that occur through the term of the contract.

YY PARKING FACILITIES – Parking garages, parking lots, and/or parking areas.

ZZ PARKING PRODUCT – Can be a location (parking facility or area of a parking facility) or time based (time of day or day of week) product offered at different rates.

AAA PARKING OPERATIONS AND PROCEDURES MANUAL – The term Parking Operations and Procedures Manual refers to the procedures and standards for the overall operation and management of the designated parking facilities proposed by the Contractor and approved by the Airports Authority.

BBB PARKING RATES – The term Parking Rates shall mean the rate structure for all parking and other fees to be charged to customers in connection with this contract, which shall be established by the Airports Authority and shall be able to be changed by the Airports Authority.

CCC PHOTO ID BADGES (CONSTRUCTION/GREEN) - Identification badge issued by the Airports Authority for escorted access to Secured, Sterile and Aircraft Operating Area (AOA) areas.

DDD PHOTO ID BADGES (RED) – Identification badge issued by the Airports Authority for escorted access to non-security areas only.

EEE PREMIUM PARKING – Preferred parking areas with different rate structure than the standard parking areas. Preferred parking areas could be nested or not and may be accessed via separate, dedicated lanes or entry occurs at regular entry lanes and assigns a different rate code to once the vehicle enters a nested area that is charged at exit.

FFF PROJECT MANAGER – The Contractor's employee designated to coordinate all activities between Contractor and the Airports Authority.

GGG PUBLIC ENTRY – Paper ticket dispensed, bankcard entry, QR code entry, or credential entry. Each method of public entry shall result in the issuance of a 'ticket' that is assigned a unique sequential entry identification number.

HHH PUBLIC EXIT – Cashier Station or Exit Station used to process payment at exit.

III QR CODE TICKET – A two dimensional bar code.

JJJ RELIABILITY – The probability of performing a specified function without failure and within design parameters for the period or the number of cycles specified under service conditions.

KKK RELIABILITY ASSESSMENT PROGRAM – Program of field tests which deals with testing a specific function's ability to operate under given environmental conditions for a particular amount of time.

LLL REMOTE AUTHORIZATION – The ability for a review attendant to receive at a workstation transactions details from an in-lane Cashier Station and approve or deny the continuation of the transaction.

MMM REMOTE CASHIERING - The ability to process exception transactions from a PARCS workstation occurring in an unstaffed exit and assist in processing exception transactions occurring in staffed lanes.

NNN SAFE/SAFETY – The condition in which persons are free from threat or danger, harm, or loss arising from improper design, manufacture, assembly, malfunction, or failure of the PARCS or any of its components or elements.

OOO SALES CHANNEL – A 3rd party selling parking and service products and collecting related fees for Dulles Airport parking products.

PPP SHOP DRAWINGS – Drawings or sketches prepared by the Contractor for use in its manufacturing facility, assembly facility, or shop, to fabricate, assemble, and/or install parts of the PARCS, whether manufactured by it from raw materials or purchased from others in a ready-to-use condition.

QQQ STOLEN TICKET – A paper ticket that has been pulled and then the vehicle backs out of the entry.

RRR TERMINAL BUILDING – The main terminal building at Dulles Airport where the airline ticketing, check-in and baggage claim functions occur as part of the passengers' intermodal transfer.

SSS THIN-FILM-TRANSISTOR LIQUID-CRYSTAL DISPLAY (TFT LCD) - Is a variant of a liquid-crystal display (LCD) which uses thin-film transistor (TFT) technology to improve image qualities such as addressability and contrast. A TFT LCD is an active-matrix LCD, in contrast to passive-matrix LCDs or simple, direct-driven LCDs with a few segments

TTT VALET PARKING – A parking area where a customer drops off his vehicle and keys near the Terminal building, the vehicle is parked by a valet runner further from the Terminal in a storage area, and upon customer arrival the vehicle is retrieved from the storage parking area.

UUU VIRTUAL TICKET – An entry media other than a paper ticket used by a customer to enter the parking facility.

2.2 Abbreviations

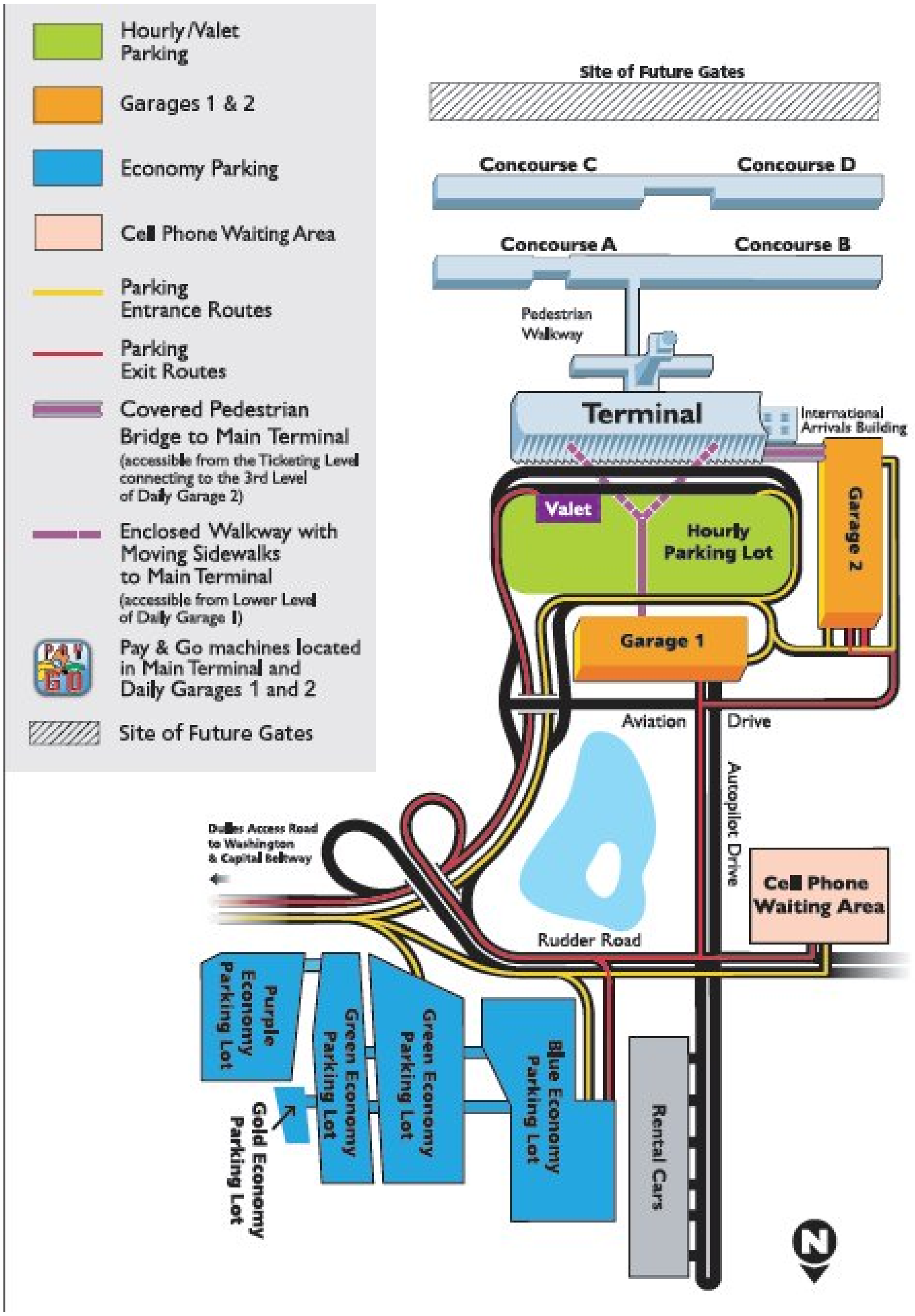
ABA	American Bankers Association
ADA	American Disabilities Act
AES	Advanced Encryption Standard
ANSI	American National Standards Institute
AOA	Aircraft Operating Area
API	Application Program Interface
AVI	Automated Vehicle Identification
BI	Business Intelligence
BIN	Bank Identification Number
CAD	Computer Aided Design
CDMS	Central Data Management System
CDRL	Contract Deliverable Requirements List
CFR	Code of Federal Regulations
CO	Contracting Officer
COR	Change Order Request
COTR	Contracting Officer's Technical Representative
COTS	Commercial Off-The-Shelf
CPI	Consumer Price Index
CR	Non-rechargeable Lithium Battery
CRM	Customer Relationship Management
dB	Decibel
DCA	Reagan National Airport
DES	Data Encryption Standard
DRP	Disaster Recovery Plan
DTE	Diagnostic and Test Equipment
EIA	Electronic Industries Alliance

EMI	Electromagnetic Interference
EML	Electronic Maintenance Log
EMV	Europay/MasterCard/Visa
EPROM	Erasable Programmable Read-Only Memory
ERD	Entity Relationship Diagram
ERP	Enterprise Resource Planning
ETL	Extract Transform Load
EZPASS	The E-ZPASS System
FDR	Final Design Review
FMS	Facility Monitoring System
IAD	Dulles International Airport
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IRW	Image Review Workstation
ISO	International Organization for Standardization
JCM	Job Coordination Meetings
KVM	Keyboard, Video, Mouse
LAN	Local Area Network
LCD	Liquid Crystal Display
LCIP	Lane Control Interface Processor
LED	Light Emitting Diode
LLRU	Lowest Level Replaceable Unit
LPI	License Plate Inventory
LPN	License Plate Number
LPR	License Plate Recognition
MLPI	Mobile License Plate Inventory
MSD	Magnetic Stripe Data
MSDS	Materials and Safety Data Sheets
MTBF	Mean Time Between (Relevant) Failures
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFC	Near-field Communications
NFPA	National Fire Protection Association
NTP	Notice to Proceed
OCR	Optical Character Recognition
ODBC	Open Data Base Connectivity
OEM	Original Equipment Manufacturer
PA DSS	Payment Application Data Security Standard
PAN	Primary Account Number
PARCS	Parking Access Revenue Control System
PCI	Payment Card Industry
PCI DSS	Payment Card Industry Data Security Standard
PDR	Preliminary Design Review
PGS	Parking Guidance System
PIN	Personal Identification Number
PM	Project Manager
PoE	Power over Ethernet
POF	Pay-on-Foot Station
PRS	Parking Reservation System
QA	Quality Assurance
QC	Quality Control
QR	Quick Response
TFT LCD	Think-Film-Transistor Liquid-Crystal Display

TPQR	Third Party Quick Response
RDBMS	Relational Database Management System
RF	Radio Frequency
RMS	Revenue Management Software
RC	Remote Cashiering
SATA	Serial ATA
SCM	System Configuration Management
SCS	Space Control System
SNMP	Simple Network Management Protocol
SQL	Structured Query Language
TIA	Telecommunications Industry Association
TFT	Thin-Film Transistor
UPS	Uninterruptable Power Supply
VAC	Volts, Alternating Current
VDC	Volts, Direct Current
VDOT	Virginia Department of Transportation
VOC	Volatile Organic Compound
VoIP	Voice over Internet Protocol
VM	Virtual Machine

3 CURRENT CONDITIONS

3.1 Dulles Airport Parking Facilities Map



3.2 Parking Facility Details

A Tables 1A and 2A provide information for the Dulles Airport parking facilities and transaction volumes included in the scope of this PARCS project.

B Tables 1B and 2B provide information for the Regan Airport parking facilities and transaction volumes for the calendar year 2014. Within five years the Airports Authority plans to add the Regan Airport parking facilities to the

Dulles Airport PARCS so that both airport campuses are unified onto a single PARCS i.e. uPARCS.

Table 1A: Summary of Dulles Airport Parking Facilities

Locations	No. of Spaces	No. of Entry Lanes	No. of Bus Entry Lanes	No. of Exit Lanes	Staffed Lanes	No. of Bus Exit Lanes
Economy Lot	12,398	4	2	9	3	3
Garage 1	4,680	5	-	7	2	-
Garage 2	3,645	4	-	7	2	-
Hourly Lot	678	5	-	9	3	-
Valet Parking	795	0	-	1	-	-
North Lot Employee Parking	4,909	4	1	5	-	1
West Lot Employee Parking	173	2	-	2	-	-
East Lot Employee Parking	849	3	-	3	-	-
TOTAL	**28,127**	**27**	**3**	**43**	**10**	**3**

Table 1B: Summary of Reagan Airport Parking Facilities

Locations	No. of Spaces	No. of Entry Lanes	No. of Bus Entry Lanes	No. of Exit Lanes	Staffed Lanes	No. of Bus Exit Lanes	POF Units (Credit Only)
Garage A	1,397	3		4			
Garage B/C	5,306	8		9	3		
Economy	2,653	2	1	2	1	1	
Short-Term	99	1		1			
Subtotal	9,455	14	1	16	4	1	
Cell Phone	33						
TOTAL	**9,488**	**14**	**1**	**16**	**4**	**1**	**12**

Table 2A: 2014 Dulles Airport Parking Transaction Volumes

Locations	Avg. Monthly Transactions	Total Annual Transactions
Economy Lot	32,722	392,661
Garage 1	23,661	283,331
Garage 2	19,063	228,755
Hourly Lot	142,880	1,714,565
Valet Parking	2,364	28,363
TOTAL	**220,640**	**2,647,675**

Table 2B: 2014 Reagan Airport Parking Transaction Volumes

Locations	Avg. Monthly Transactions	Total Annual Transactions
Garage A	20,044	240,535
Garage B/C	74,949	899,389
Economy	16,972	203,670
Short-Term	3,335	6,670
TOTAL	**112,522**	**1,350,264**

3.3 Current PARCS Environment

A Currently three different PARCS vendor solutions are in place at IAD and DCA supporting their respective parking facilities and operations. With three systems, the Authority has multiple applications and systems administration teams with multiple operational and support centers that demand overheads in terms of people, processes and technology. Below is an overview of parking systems operational at IAD and DCA Airports:

	IAD PARCS	IAD Valet	DCA PARCS
Vendor Solution	ACS	ZipPark	CTR
Application Software	C++, Visual Basic	Microsoft .NET	C++, C#
Database Engine	Oracle DB 10g SQL Server 2005	SQL Server 2005	SQL Server 2005
Operating System	Windows	Windows	Windows

Table 3: Current Technical System Overview

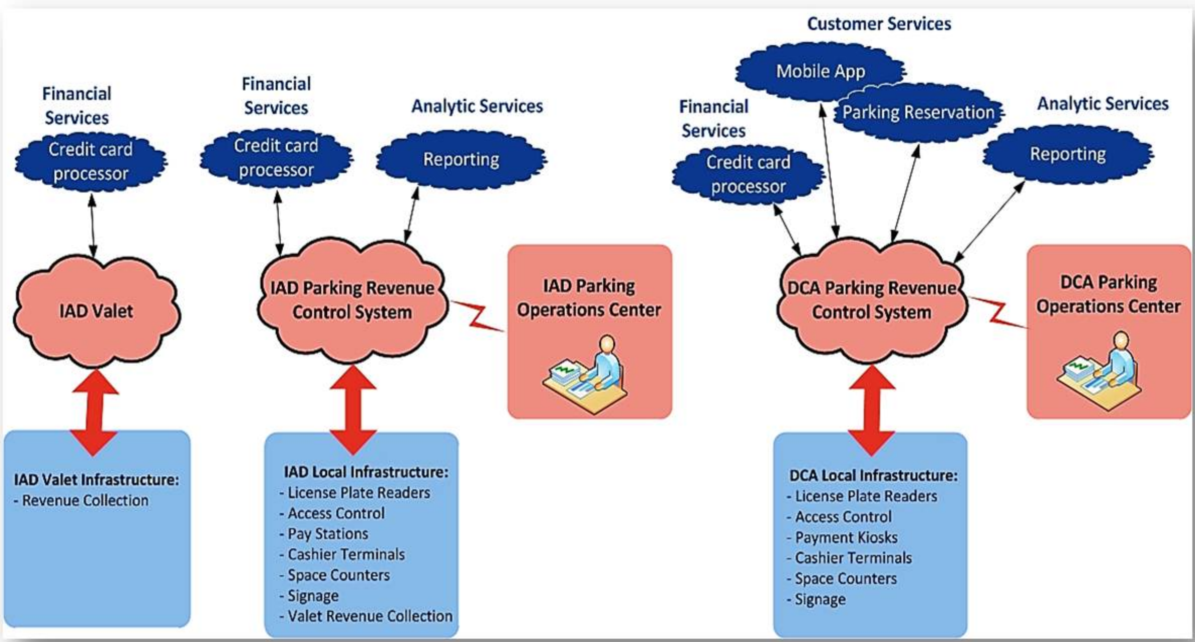


Figure 1: Current MWAA PARCS Architecture

B Limitations of As-Is Environment - The existing MWAA parking solution is depicted in Figure 1; the IAD parking components face the following limitations:

1. Lack of Integration Between PARCS Components – As illustrated in the current MWAA PARCS architecture, there are many separate components requiring manual processes because of the inability to interface components.

2. Non-Compliance Risk: The IAD PARCS system faces considerable PCI DSS level 2 compliance risks. Additionally, the current PARCS cannot accept the new “Chip-and-PIN” bankcards.
3. Lack of Flexible Parking Rates: Unable to use information about parking utilization to evaluate various pricing schemes and offer variable rates for yield management.
4. Limited Technology: The IAD PARCS cannot interface with various web and mobile applications to access parking availability information, reserve parking spaces, make electronic payments or use specific system functions.
5. Inadequate automated processing support and controls: The IAD PARCS system has many manual processes, with a high potential for human error and duplication of effort.
6. Costly Maintenance: IAD PARCS is at the end of its life, demanding a considerable maintenance budget.
7. System Operational Life Span: The existing system reached end-of-life in less than 10 years.

4 GENERAL SCOPE OF WORK

This section provides a summary of the new PARCS scope, future PARCS requirements including the uPARCS unified solution, as well as administrative project requirements. It also identifies items to be provided by the Airports Authority and by the Contractor. More specific requirements are identified in the succeeding sections/chapters.

4.1 Project Overview

A The Airports Authority's goal is to provide world class parking services to its customers. The PARCS design includes many features to provide innovative methods of access, products, promotions, and payment methods to its customers. The Features Matrix and Technical Specification Exception List allows PARCS Providers to identify which features they currently offer, which features they are willing to develop, and which features will not be developed. Consideration is given to all Contractors meeting the experience qualifications knowing that no single vendor can meet all of the requirements in this technical specification document.

B The objective of the new PARCS is to provide robust flexibility and functionality for the Airports parking service. The PARCS shall have open-systems architecture to allow uncomplicated integrations and interfaces with other systems, websites, and mobile applications. The PARCS shall support electronic entry media and discounts and innovative payment technologies such as “Chip and PIN” and contactless NFC mobile payment technologies.

C The PARCS shall provide the ability to accurately document and track revenues generated by Authority Parking facilities and operations.

D The PARCS shall provide complete audit, accountability and traceability of all revenues and fees collected.

E The system shall be characterized as a fully online, real time, open architecture that utilizes commercial off-the-shelf (COTS) equipment/software/hardware to the greatest extent possible. COTS is defined as requiring configuration that is tailored for specific uses. The key characteristic that differentiates COTS from custom software is that the user configurations are within the defined parameters of the commercial item and not the result of customizations to the commercial item itself.

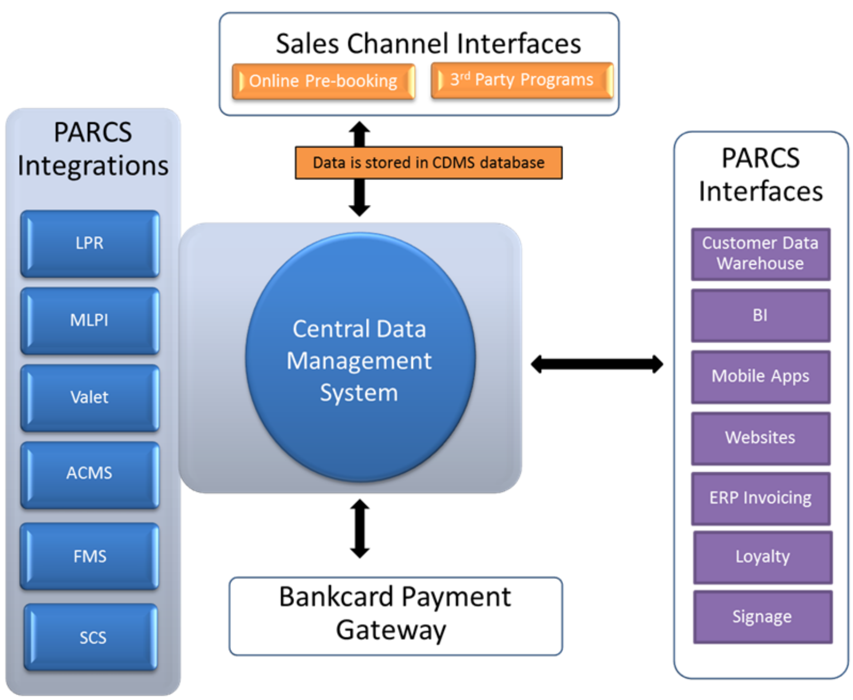
F If the proposed system offers customer-enhancing products and services that are not included in this technical specification, the Contractors are encouraged to include these features in their proposal along with pricing for each feature in the Alternate Bid section of the Price Schedule Form.

G All data processed through the PARCS is considered the property of the Airports Authority. Data sharing is vital to the Airports Authority's strategic plans. The PARCS will have multiple integrations and interfaces with other PARCS modules, Airports Authority applications, and third party sales channels and applications.

H The Airports Authority desires the PARCS to operate initially, or at some point in the future, in a cloud environment (provided by Contractor) for development, testing, deployment, and ongoing operations. The Contractor shall provide local servers, network, and connectivity from which the PARCS will run in a local environment until the PARCS cloud environment is available.

I The conceptual PARCS architecture is illustrated in Figure 2 with further details included in the CDMS Section

Figure 2: IAD Conceptual PARCS Architecture



1. As illustrated in Figure 2, the CDMS PARCS Integrations share the same dedicated PARCS network and the data is stored in the CDMS..
2. The PARCS Reporting server shall interface to the online prebooking application .so that PARCS reports include all revenue and activity from these interfaces along with PARCS revenue and activity.

J The PARCS shall include the following integrations:

1. LPR System
2. MLPI System
3. Valet System
4. Access Credential Management System (ACMS)
5. Facility Monitoring System (FMS)
6. Space Count System (SCS)

K The PARCS shall provide the following interfaces that provide PARCS data to Airports Authority applications and third party applications:

1. PARCS to the Airports Authority Customer Data Warehouse/Customer Relationship Management (CRM).
2. PARCS to the Airports Authority Business Intelligence solution.
3. PARCS to the Airports Authority Oracle EBS R12 employee invoicing application.
4. PARCS to the online pre-booking Parking Reservation System.
5. PARCS to the Customer Loyalty Program.
6. PARCS SCS to Garage 1 and Garage 2 stacked space available signs.
7. PARCS SCS to Garage 1 and Garage 2 per level space available signs.
8. PARCS SCS real-time space count integration with the Airports Authority website.
9. PARCS SCS real-time space count integration with the Airports Authority mobile application.

L The PARCS shall include the following functionality:

1. Central Data Management System
2. Revenue Management System
3. Valet
4. License Plate Recognition
5. Mobile License Plate Inventory
6. Facility Management System
7. Access Credential Management System
8. Pre-Booking Parking Reservation System
9. Customer Loyalty Program
10. Space Count System
11. Reports

M The PARCS shall include the following equipment:

1. CDMS hardware and network components
2. Entry Stations with pinhole cameras.
3. Pay-on-Foot Station with pinhole cameras.
4. Exit Stations with pinhole cameras.

5. Cashier Stations with exterior booth-mounted Transaction Panels.
6. Handheld point-of-sale units
7. LPR lane equipment.
8. Barrier gates.
9. Intercoms.
10. 1D/QR barcode readers.
11. EMV bankcard chip readers.
12. Contactless bankcard/Near Field Communication (NFC) readers
13. Proximity card readers.
14. AVI readers.
15. Central Cashier Stations.
16. Uninterruptible Power Supply (UPS) units.
17. Valet handheld units.
18. 360° lane valet cameras.
19. Mobile License Plate Inventory handheld units.
20. MLPI vehicle units
21. PARCS bankcard refund unit.
22. Validation/discount production unit
23. Clamshell validators.
24. Entry lane VMS rate signs.
25. Lane VMS signs.
26. Vehicle detection hardware (including loops if proposing a loop-based detection system).
27. 4” Galvanized bollards with sleeve covers as needed at entry and exit to protect the lane equipment.
28. Test bed equipment located outside on level one of Garage 2.

4.2 System Life, System Expansion, and uPARCS

A The proposed PARCS for IAD shall be capable of accommodating the features defined in this section that the Airports Authority will implement both initially and in the future without having to replace the PARCS to be installed at IAD.

B The Airports Authority intends to implement a unified PARCS solution (uPARCS) within five years. A unified PARCS means that both MWAA airports (IAD and DCA) will share PARCS servers/network and operate using a single PARCS application. The uPARCS solution shall first be implemented at IAD through this project and shall be extended to DCA at a point in time to be determined by the Authority. DCA PARCS requirements are the same as IAD PARCS requirements except that DCA does not have valet parking.

1. The uPARCS shall provide the same performance levels when DCA is added to the system.
2. The uPARCS shall provide separation of airports for functionality, operation configurations, and data access/reporting based on user ID. Some users shall have access to both airports while others have access to one airport.

C The PARCS system shall provide the Airports Authority the capability to expand and upgrade their PARCS to meet future IAD parking requirements

(revenue and non-revenue parking areas) for the next ten (10) years without having to replace major components of the PARCS (excluding upgrades). For example, the PARCS shall be capable of adding new parking facilities, adding/removing lanes of equipment at existing facilities, and re-designating facilities. It shall be capable of expanding to the unified PARCS (i.e. uPARCS) to include DCA's existing and future parking (revenue and non-revenue) areas at some point in the future.

D The proposed PARCS shall be upgradeable, scalable, and modular in design such that it can support the Authority's current and future expansion needs. The system shall be designed with excess capability such that it shall process as many as 300% of the current number of IAD transactions without any degradation in system performance even during peak periods.

E The PARCS shall support adding nested parking features at some point in the future.

1. Accommodate gated and un-gated nested areas.
2. Nested areas with different rate structures:
   a Entry media is re-encoded or assigned a different rate structure than standard parking areas when entering the nested area.
3. Provides timing feature to track entry into and out of nested areas.
   a Can assign penalties for delays in arriving or exiting nested areas.

F The PARCS shall support adding VIP programs at some point in the future.

1. The programs may use a PARCS credential tied to a bankcard.
2. The PARCS shall be able to interface with third party VIP programs with a credential provided by the customer (bankcard, license plate) or the third party provider.
3. The PARCS shall allow different rates and access privileges based on:
   a Customer ID.
   b Time of day, day of week.
   c Parking facility.
   d Parking product.
4. Records all VIP program revenue and transactions in the PARCS database.

G The PARCS shall support future third party applications and sales channels additions.

1. The PARCS shall support interfacing with future third party applications and sales channels to recognize program credentials and receive program data as needed.
2. The PARCS shall record all sales channel revenue and transactions in the PARCS database.

H The PARCS shall support interfacing to a future Automated Parking Guidance System.

I The PARCS shall support interfacing to the E-ZPASS tolling application at some point in the future.

4.3 Delivery, Storage and Handling

A Deliver equipment to site packaged to prevent damage and marked for easy identification.

B Assume care, custody and control of all PARCS equipment and components.

C Store equipment in original containers in clean, dry locations designated by Contractor or Airports Authority and agreed to by PARCS installer.

D Replaced damaged materials at no cost to Airports Authority.

4.4 Environmental/Project Site Conditions

A The Contractor shall utilize premium grade equipment designed to operate reliably within the specified environmental and operating circumstances of the Dulles Airport.

B All field equipment and components to be fully protected from the ambient environment when installed in the proper housing provided by the Contractor. Operation of the equipment shall not be effected in any way by weather conditions typical to the North Virginia area. In addition, operation of the equipment shall not be effected in any way by the conditions listed below:

1. Ambient Temperatures: -10ºF to 120ºF (with addition of solar loading)
2. Humidity: 0% to 99% (non-condensing)
3. Snow: Freezing snow and ice
4. Rain: Intense, blowing rain
5. Wind: Comply with local building code
   a The barrier boom fixture shall be able to withstand winds of up to one hundred and twenty (120) miles per hour and meet local conditions stated in the General Scope of Work section.
6. Dust: Accumulating and blowing dust and fine sand

C The Contractor shall be responsible for advising the Airports Authority if there are any special environmental factors to which its equipment may be sensitive that are not listed in this Technical Specification.

D Message screen (Color or Black & White) minimum six (6) inch diagonal display that is easily readable in all ambient lighting conditions including full sunlight.

E All devices and component enclosures shall be National Electrical Manufacturers Association (NEMA) Type IV weather resistant or equivalent. Metal enclosures shall be finished in acrylic enamel to match other equipment if required. The Contractor shall submit color samples and finishes to the Airports Authority Representative for approval. Non-standard housing colors shall be made available for selection at no additional cost to the Airports Authority. Indicator cabinet shall be constructed for easy installation with provision for easy access to display unit. Enclosures shall have seals to keep out dust and moisture and include cooling fans and heaters as needed.

F The PARCS equipment shall be designed to be resistant to liquid ingress caused by driving rain and incidentally splashed water such as would occur during routine equipment and/or platform cleaning. Equipment enclosures

shall comply with IEC Standard 60529 (IEC 60529) to level IP54 or equivalent and compliant with the Airports Authority internal policies.

G Present the Contractor's solution for preventing power interference to the Airports Authority for approval prior to implementation.

H Provide and install lightning protection for the PARCS through surge arrestors or earthen ground rods, where appropriate, or a combination thereof. Determine, based upon the Airports Authority's proposed PARCS requirements, the appropriate lightning protection method to use for the location where the equipment is installed.

I Equipment to be UL-approved for use as part of a master labeled lightning protection system and marked in accordance with UL procedures.

J Electrostatic and electromagnetic forces within the environment, e.g., non-direct lightning strikes, or other types of power interference shall have no effect upon the integrity or operation of the PARCS.

K The Contractor shall ensure that no equipment damage occurs during manufacture, storage, shipment and operation because of climatic conditions that differ from those in this Specification.

L Power

1. The Electrical sub-contractor provided by the Contractor shall provide power wiring and conduit as shown in the Contract Drawings. This is intended to include all communications wiring and any additional power wiring and conduit required by the PARCS. If additional wiring or conduit is required, the Contractor will submit a description and reason for the requested additions. The Airports Authority will evaluate the request and fund the additions through a contract Change Order. The Electrical sub-contractor will provide additional items as approved by the Airports Authority.
2. Contractor to provide input to 90% and 100% electrical design based on their systems requirements . CDRL 101.
3. Electrical Power Source -- Power circuits provided in the hardware devices for the parking equipment shall be rated 120 Volts, Alternating Current (VAC), 60 Hz, 20 amp (maximum), and single-phase alternating current with separate ground wires. Voltage range tolerance shall be +10% to 20% and frequency variability range of +1 Hz to 3 Hz. Each lane shall receive power from a dedicated, separate circuit. Parking equipment shall draw no more current than permitted by the National Electric Code (NEC) for a 20-amp circuit.
4. The Electrical sub-contractor shall provide replacement of all required loops for the PARCS as shown in the Contract Drawings. CDRL 102.

4.5 Code Requirements and Standards

A Unless otherwise specified, all PARCS components and equipment shall be new, free of defects, and installed in accordance with these design requirements.

B The equipment components and their installation shall comply with all laws, ordinances, codes (e.g. OSHA, ADA, and NEC), rules, and regulations of public authorities having jurisdiction over this part of the work. It shall be the responsibility of the Contractor to meet these and other current technical,

performance, and safety standards that are applicable to all components and to the entire system, even when not specifically referenced.

C PARCS shall be PCI DSS, ADA, and EMV compliant with upgrades to meet future changes. All hardware and software configuration settings, processes (both manual and automated), policies, procedures, reports, network architecture, data storage schemes and other products resulting from this specification shall comply with the PCI Security Standards Council Data Security Standard (PCI-DSS) in effect at the time of installation. PARCS shall also be compliant with the Airports Authority's network enterprise system and security requirements.

D The PARCS, when installed, shall as a whole comply with the requirements of the American with Disabilities Act (ADA) including the 2010 ADA Standards for Accessible Design (www.ada.gov/2010ADAstandards_index.htm) and any Virginia or local jurisdiction requirements for accessibility, communication and use by individuals with disabilities and compliant with any Airports Authority internal policies. The Contractor shall be responsible for determining which parts of the PARCS need to be ADA compliant. The Contractor shall provide the Airports Authority for review an ADA Compliance Analysis Report, as part of the PDR package. CDRL 103 The Contractor shall also comply with all requirements within Title 49 Part 27 of the Code of Federal Regulations (CFR).

E The following is a list of standards referenced in the contract documents. The list is not all-inclusive and the Contractor shall be compliant with any Airports Authority internal policies. The latest revision in effect for each standard at the time of Notice-To-Proceed (NTP) shall be used in conjunction with the contract documents.

1. ADA.
2. CFR.
3. ANSI X9.24, Financial Services Retail Key Management.
4. Federal Communications Commission emission limits.
5. FIPS 140-2.
6. International Electrotechnical Commission (IEC) 529.
7. ISO 9001.
8. ISO/IEC 7816 parts 1 through 3.
9. ISO/IEC 14443.
10. ISO/IEC 18092 / ECMA-340, Near Field Communication Interface and Protocol-1.

4.6 Verification of Existing Conditions

A The Contractor shall evaluate and document the existing condition of the following items and recommend replacements and modifications along with reasons for the recommendations for the Airports Authority's approval. Once approved by the Airports Authority a Change Order shall be made for the Contractor to provide the replacement/modifications. The Airports Authority reserves the right to procure and provide the replacements/modifications.

1. PARCS devices and components that are identified as being considered for re-use.

2. Existing power supplies, communication conduit/cabling components and conduit for the PARCS.
3. Server rooms provided by the Airports Authority for a locally hosted CDMS solution.
4. Existing PARCS network that shall be used and recommend modifications and reasons for the modifications to the network.

B Evaluation of existing conditions shall be conducted after contract award and submitted prior to the Preliminary Design Review meeting.

C The Contractor shall document field inspections, evaluations and all recommendations for reuse of existing devices, wiring/cabling, power supplies, conduit, server room conditions, and PARCS network for approval by the Airports Authority. CDRL 104

4.7 Items Considered for Re-Use

A The Contractor shall re-use, when economically advantageous to the Airport's Authority, the following components already in place at Dulles Airport. The number and location of hardware available for reuse is included in the PARCS Base Bid Equipment Matrix located in Appendix A. After contract award, the Contractor is responsible for evaluating the condition of the following existing components and recommending at the Preliminary Design Review the replacements and additional parts needed to interface with the proposed PARCS.

1. Intercoms.
2. TransCore Encompass 5 Automated Vehicle Identification (AVI) readers and AA3152 antennas.
3. Garage 1 and Garage 2 stacked space available signs.
4. Garage 1 and Garage 2 per level space available signs.
5. Bollards.

4.8 Items Provided by the Airports Authority

A The Airports Authority shall provide the Contractor with electrical access needed to the perform installation services.

B The Airports Authority shall provide the Contractor with parking for the Contractor's employees while performing the work specified herein.

C There are no anticipated modifications to the current parking facilities, entry lanes and exit lanes. If modifications are required, they shall be provided by the Airports Authority.

D For a locally hosted CDMS solution, the Airports Authority shall provide onsite space for the primary and redundant servers. The Airports Authority may ask the Contractor to perform any work identified in the Contractor's assessment of existing conditions under a Change Order.

E Power, telecommunications, data fiber, and conduit identified as needing replacement in the Contractor's assessment of existing conditions shall be provided by the Airports Authority. The Airports Authority may ask the Contractor to perform this work under a Change Order.

F The Airports Authority shall offer the existing dedicated PARCS network to the Contractor in an 'as is' condition. After the contract has been awarded, the Contractor shall perform an on-site conditions assessment to identify the components needed to modify the current PARCS network. The

conditions assessment findings shall be submitted to the Airports Authority prior to the Preliminary Design Review meeting.

1. The Airports Authority shall negotiate a fee and issue a Change Oder for the network modifications with the selected Contractor. The Airports Authority reserves the right to procure and install the network components needed to modify the current network.

G The Airports Authority shall provide and maintain all PARCS workstations and related operating system software (OSS).

4.9 Items Provided by Contractor

A The Contractor shall be responsible for the design, manufacture, fabrication, furnishing, assembly, testing, and inspection of an integrated PARCS serving the Dulles International Airport parking system.

B The Contractor shall provide all hardware, software, tools, equipment, materials, labor, supervision, project management and all other items necessary or proper for, or incidental to, designing and installing, implementing and maintaining an integrated Parking Access and Revenue Control System (PARCS) solution at Dulles Airport in accordance with this Technical Specification.

C The Contractor shall install vehicle detection devices (new loops or other components depending on the detection method used) in each entry and exit lane and vehicle count point.

D The Contractor shall provide, maintain, and monitor the CDMS solution. This includes:

1. CDMS servers.
2. PARCS network, and related network components such as routers, switches, and firewalls.
3. Software required for CDMS hardware and network including monitoring and antivirus.

E The Contractor shall provide the FAT servers and test bed server.

F The Contractor shall provide all requirements included in this specification unless noted as in the Technical Specification Exceptions List submitted with the proposal documents.

4.10 PARCS Project Schedule

A Note that all facilities shall be unavailable for installation during the following periods however, development and testing that does not affect the operation may occur during this phase:

1. Thanksgiving (11/17/15 – 11/28/15)
2. Christmas (12/17/15 – 01/04/16)

B The following schedule outlines the maximum time allowed for each phase of work. Should work be completed before the end of each phase's timeline, it is assumed the next phase shall commence immediately thereafter.

C Phase 1: System Design

1. NTP + five (5) months:
   a System design

   - b Feature development
   - c FAT testing

D Phase 2: Installation

1. FAT acceptance + seven (7) months:
   - a Complete server configuration and testing
   - b Test bed installation
   - c Install and test PARCS lane devices and components including:
     - i LPR
     - ii MLPI
     - iii SCS
     - iv FMS
     - v ACMS
     - vi Discount Production Unit
   - d Implement other PARCS components

E Phase 3: Acceptance Testing

1. The following testing commences when all contract deliverables are received and all PARCS equipment is successfully installed subject to requirements outlined in Post-Installation Services section:
   - a 30-day Operational Test (minimum duration)
   - b 30-day Remediation of Operational Test results (anticipated 30-day maximum)
   - c 30-day Final System Acceptance Test (minimum duration)
   - d Project Closeout (anticipated 15-day maximum duration)

F No less than twenty-eight (28) days prior to the first lane test date as defined in the Post-Installation Services section, the Contractor shall CDRL 105:

1. Install, configure, and make operational the CDMS.
2. Deliver all maintenance and operating manuals.
3. Complete all associated training.
4. Deliver all ticket stock.
5. Deliver all credential stock.
6. Deliver all receipt stock.
7. Deliver all special tools and equipment.

G The Contractor is solely responsible for the scheduling of the Contract Scope of Work. All scheduling activities are described in the Project Support section herein.

5 CENTRAL DATA MANAGEMENT SYSTEM

This section identifies technical requirements of the PARCS architecture, servers, workstations, network, database, data storage, data backup and archiving, software, security and administration, status monitoring, and offline requirements.

5.1 General Requirements

A The PARCS shall consist of three key components:

1. Local fiber, network, router, servers and server infrastructure shall be owned by the Airports Authority but shall be provided, maintained, and monitored by the Contractor until a cloud environment solution is available, at which time the local servers would no longer be needed; Under a cloud environment, the Contract shall provide, maintain, and monitor the PARCS network;
2. A central parking management software system that enables the Airports Authority’s parking services to be operated and administered; and;
3. A service layer that applies an open architecture standards approach to integrate the parking Central Data Management System (CDMS) with internal and external systems and services. Open architecture is defined as being designed to make adding, upgrading and swapping components easy. The Airports Authority shall be able to see inside all or parts of the architecture without proprietary constraints. License agreements shall be provided if needed.

B The PARCS shall provide the ability to accurately monitor, document and track activity and revenues generated by Authority Parking facilities and operations. This includes:

1. Main Terminal (Surface) Lot
2. Daily Garages 1 and 2
3. Economy Lot
4. Employee Parking
5. Valet Parking

C All PARCS equipment shall communicate with the CDMS for transfer of all stored data and transfer of equipment parameters. The CDMS shall provide automatic monitoring and control of all PARCS devices connected to the network.

D The CDMS shall be capable of transmitting, receiving, processing and storing data in all possible scenarios, including the following:

1. Simultaneous (synchronous) receipt of data from all facilities. It shall be characterized as a fully online and real time system.
2. Simultaneous receipt of data from one or more facility while data is being transmitted to one or more facility.
3. Simultaneous receipt and transmission of data to and from PARCS equipment while receiving report queries from CDMS users, data transmissions to and from other Airports Authority data systems, communications with 3rd party servers, and requests from other portions of the network.

E The PARCS shall record the entry, payment, and exit data for each transaction in a way that allows a closed ticket to be traced to the entry,

payment and exit data, and allows an open ticket to be traced to the entry data.

F All PARCS transactions shall be recorded in such a manner as to allow an audit to be conducted for all transactions, customers, payment type, product, and facility levels. The intent is to allow all transactions to be linked back to the master records for reporting, analysis, data retrieval, and legal purposes.

G Provide the Airports Authority with the ability to close orphaned records in the CDMS.

H Each transaction shall have a unique identifier assigned to all activity associated with the transaction from start to end so that a single transaction can be easily traced through the PARCS. This includes, at a minimum:

1. Advance payment
2. Entry
3. Discounts
4. POF payments
5. Exit payments
6. Post-exit payments

I The PARCS shall have an open architecture to allow interfaces with:

1. 3rd party sales channels and registered parker programs
2. Other 3rd party applications
3. PARCS and 3rd party websites
4. Airports Authority Business Intelligence, Customer Relationship Management, Oracle ERP via its Service Oriented Architecture.
5. Airports Authority and 3rd party mobile applications

J All PARCS data is owned by the Airports Authority and shall be accessible for interfacing, exporting, and downloading with other applications including Excel, Access, and .csv format.

K Access and the ability to summarize and drill down into the PARCS data are vital functions of the PARCS. The proposed PARCS solution shall allow the Airports Authority to access, filter and sort summary data and efficiently obtain detail data and summary data. This includes, at a minimum, the ability to retrieve the following data types for selectable time periods:

1. Revenue by:
   a Parking facility
   b Parking product
   c Campaign/promotion
   d Equipment ID
   e Customer ID
   f User ID (cashier, review attendant)
   g Payment type
   h Transaction type
   i Entry media type
   j Sales channel
   k License plate region

2. Average transaction value for all items listed in Section 5.1.K.1.
3. Dollar Value and number of Discounts by:
    a All items listed in Section 5.1.K.1.
    b Promotion ID
    c Validation account number
4. Number of Transactions in total or by Transaction Type for all items listed in Section 5.1.K.1.
5. Occupancy data by parking facility, parking areas, and parking product:
    a Average and peak occupancy by
        i Hour of day
        ii Day of week
        iii Mid-week
        iv Weekend
        v Holiday/vacation periods
6. Duration by:
    a Parking facility
    b Parking area
    c Parking product
    d Payment type
    e Discount type
    f Hour of day
    g Day of week
    h Daily
    i Weekly
    j Monthly
7. Rate increment activity by:
    a Fee increment
    b By hour
    c By day
    d Parking facility
    e Parking area
    f Parking product
    g Payment type
    h Discount type

L The PARCS shall be upgradeable, scalable, and modular in design such that it can support all of the Airports Authority's current and future needs. The system shall be designed with excess capability such that it shall process as many as 300% of the current number of transactions without any degradation in system performance even during peak periods.

M It is the Contractor's responsibility to verify that the specifications in the CDMS section are adequate for the proposed PARCS. Any deficiencies, changes, or suggestions shall be identified in the Contractor's proposal.

N The use of suitable scaling techniques and technologies to properly size and configure the CDMS to address both current and future needs shall be provided in the overall system architecture design. The Contractor shall

provide the overall system architecture design to the Airports Authority for review at the PDR and for approval at the FDR. CDRL 106

O The Contractor shall submit a complete description of the CDMS functionality for the Airports Authority's review at the PDR and approval at the FDR fully describing the overall system architecture design and the operation, capabilities, and functionality of the CDMS. CDRL 107

5.2 System Architecture

A The Contractor shall implement a commercial off-the-shelf (COTS), to the greatest extent possible, for the Parking Access Revenue Control System and key interfaces. COTS is defined as requiring configuration that is tailored for specific uses. The key characteristic that differentiates COTS from custom software is that the user configurations are within the defined parameters of the commercial item and not the result of customizations to the commercial item itself.

B Processing redundancy shall be built into the system to ensure no data loss and high rate of availability.

C The Airports Authority either desires the PARCS to operate initially, or at some point in the future, in a cloud environment (provided by Contractor) for development, testing, deployment, and ongoing operations. The Contractor shall provide local servers, network, and connectivity from which the PARCS will run in a local environment until the cloud environment is available, at which time the local servers would no longer be needed.

D For both the cloud environment solution and the locally hosted solution, the network, servers, routers/switches, and databases shall be provided, maintained, and monitored by the Contractor. The cloud solution will be owned and managed by a hosting company which provides a dedicated Airports Authority environment protected behind a firewall.

E The Contractor shall provide, maintain, and monitor all CDMS components, except PARCS workstations, and shall include:

1. Primary and redundant PARCS servers.
2. Factory Acceptance Test servers.
3. Test bed server.
4. All CDMS software for servers and network including the OSS and PARCS application software.
5. All PARCS network components including routers, switches, network, fiber, firewalls, and any other connectivity infrastructure required for the PARCS system that will run in the local environment.
6. Interfaces with other PARCS components and third party applications.
7. PARCS databases.

F The Airports Authority shall provide, maintain, and monitor the following CDMS components:

1. Workstations and operating system software.

G The Contractor shall provide the Airports Authority with requirements for the CDMS components that are provided by the Airports Authority. This includes specific software/hardware brands, configurations, and volume

requirements needed in the CDMS to support the PARCS. The Contractor shall submit the information at the PDR. CDRL 108

H Bankcard Data

1. The PARCS CDMS shall support PCI-compliant bankcard processing and bankcard data storage. PARCS components with bankcard processing and/or data storage includes:
   a Bankcard payment processing at PARCS point-of-sale devices:
      i In-lane cashier stations
      ii Exit stations
      iii Handheld point-of-sale units
      iv Valet handheld units
      v POF stations
   b Refund processing through the PARCS
   c Bankcards presented as an entry media for:
      i Bankcard in/out transactions
      ii Pre-booked reservation entry media
   d Bankcard data kept of file for automatic charges related to:
      i Employee permit payments
      ii PARCS credentials associated registered parker programs
   e Bankcards stored on the PARCS Blocked List.
2. The Contractor shall ensure that the bankcard processing and data storage environment is fully PCI-DSS compliant including, but not restricted to, the following requirements:
   a Securely built network
   b Proper protection of cardholder data
   c Maintained vulnerability management program
   d Ensure effective access control measures are in place
   e Ensure network is regularly monitored and tested
   f Maintain an information security policy
3. The PARCS solution utilize tokenization or hashing of bank card data stored by the PARCS for transactional purposes.
4. The Contractor shall submit documentation verifying PA DSS certification of PARCS software/hardware within thirty (30) days of NTP. CDRL 109
5. The Contractor shall submit documentation verifying PA DSS re-certification when any modifications are made to the PARCS and compliance timeline for new PA DSS requirements that are issued during the term of contract, warranty period, and post-warranty maintenance service agreement period.
6. Should the Contractor fail a penetration test or become temporarily non-compliant with the PA DSS, notification of the non-compliance shall be provided to the Airports Authority within ten (10) days. The notification shall include a planned resolution date for compliance to be re-instated. The resolution timeline shall be within PCI specification and regulations.
7. The Contractor shall provide an interface with the Airports Authority's selected bankcard clearinghouse, which is currently Elavon, via a secure interface that is fully compliant with the PCI DSS.

8. The Contractor shall be responsible for development, testing and certification of the interface connection between the CDMS and the clearinghouse.

5.3 Server Requirements for Local Environment Solution

The servers are provided, maintained, and monitored by the Contractor.

A All servers shall be physically located on airport property.

B The CDMS shall be designed as a set of scalable, multi-threaded applications capable of utilizing multiple CPUs or cores and operating within a VMware virtual server environment.

C The CDMS shall support dual redundancy with primary and secondary servers, automatic failover. The Contractor shall define the expected time taken to failover and fail back. CDRL 110. The Airports Authority shall have final approval on the failover and failback procedure.

D At the PDR, the Contractor shall submit for Airports Authority review and approval the requirements for all CDMS application servers and test bed server necessary to satisfy all performance requirements in this Specification including (CDRL 112):

1. Standard server build and base requirements
2. Performance and configuration requirements
3. Database capacity requirements

E While not specifically required, it is anticipated that the CDMS will have the following:

1. Domain Controller – to manage the CDMS domain, all user privileges, distribution of software updates, and establishing the time-of-day clock for synchronization across the CDMS domain.
2. One or more Network Management Server – to control the transmission and exchange of data between the CDMS and the PARCS equipment, monitor the PARCS equipment, and provide other management and control functions specific to the devices.
3. Database Server – to manage the relational databases of the CDMS.
4. Report Server – to generate pre-defined as well as ad-hoc reports from user-supplied queries.
5. Bankcard Authorization Server– to interface with the Airports Authority's selected bankcard authorization clearinghouse service provider.
6. One or more Application Servers – to execute all CDMS-specific functions not supported by other servers.
7. Mail Server – to allow automated alarm and messaging features to be sent via email (this is a required server to be provided by the Contractor).

F The PARCS application shall allow a redundant, fault-tolerant server system that provides parallel data read/write capability and cross checking between the primary and secondary servers. A transparent, automated software switch shall be provided to detect that a primary server has failed; the secondary server has "taken over," and dispatches an alarm to the Applications Administrator that a PARCS Server has failed.

G The CDMS shall incorporate two (2) locations for storage of data:

1. Primary area – Location to be determined.
2. Secondary area - Location to be determined.

H The Contractor shall build into the system structured exception handling so that the system responds predictably to error conditions without lock-up or "crashing," and without distribution of corrupted data throughout the system. Error handling shall include those caused by hardware failures, those caused by operators, and those induced deliberately or non-deliberately in software.

5.4 Workstation Requirements

A The Airports Authority shall provide and maintain the PARCS workstations.

B Enables any authorized user to interact with the system via a standard browser-based interface. At minimum, the CDMS shall support the most recent versions (current and two prior) of MS Internet Explorer® or Airports Authority approved browser. .

C The Airports Authority prefers that its authorized staff using PARCS are able to access it via an internet browser application instead of using dedicated PARCS workstations. The Contractor shall provide a list at the PDR meeting of PARCS functions that require dedicated workstations CDRL 111.

D Workstations shall run MS Windows 7 OS or later version.

E All workstations shall have identical browser based interface and functionality workstations shall utilize identical GUI that supports:

1. Graphical presentation of operational events at lanes and statistics.
2. Graphical presentation of system overview operational status.

5.5 Network Requirements

A The PARCS CDMS and network shall be configured in an isolated network.

B All installed PARCS equipment shall communicate via a separate parking facility LAN to a communications enclosure at each facility. The communications enclosure interfaces the parking facility LAN to the Airports Authority's fiber optic backbone network.

C The PARCS shall operate from fully fault-tolerant equipment. Data and audio communication between the field locations, e.g., the entry stations and the exit stations, to the Central Data Management System (CDMS) shall be via fiber optic cable in a point-to-point configuration using an industry standard communications protocol (RS232, Ethernet, etc.). The Contractor shall submit final communications protocol configuration for review and approval by the Authority. CDRL 113

D Communication on the existing Airports Authority's PARCS network will be on a minimum 10/100 Base-TX Ethernet. It is the Authority's intention to have the uPARCS use the Authority's LAN for communications.

E At the Airports Authority's discretion, the PARCS may be placed on a separate Virtual Local Area Network (VLAN) with appropriate communication ties to the existing Airports Authority Administrative LAN. The communications infrastructure requirements and services shall be defined by the Contractor and submitted for written approval by the Airports Authority.

1. A fiber optic backbone shall be used to communicate between the communications enclosures at the parking facilities and the CDMS.
2. Any new fiber optic required shall be run by the Airports Authority.
3. Communications between the CDMS and its peripheral devices and, if necessary, with the PARCS network shall be defined by the Contractor.
4. The Ethernet communications protocol furnished by the Contractor for the PARCS LAN shall be of industry-standard and shall operate reliably. The Contractor shall select the communications protocol based on the physical distances between the PARCS equipment, the architecture of the facility's LAN and the need to have noise-immune, highly reliable communications that satisfy communication requirements.
5. The CDMS shall communicate with the PARCS test bed..

F The Contractor shall submit the PARCS network architecture and protocol for COTR review at the PDR and COTR approval at the FDR. CDRL 114

G The PARCS shall be designed to support stand-alone operations (distributed system with intelligent field devices) as well as centralized management of the PARCS.

H Each PARCS field device shall support fiber optic data connectivity, including the use of media converters where appropriate.

I The Airports Authority shall provide Internet Protocol (IP) addressing schemes.

J The Contractor shall provide the switch and configure the ports.

K The Contractor shall provide the switchboard, terminate, and plug into the port.

L The Contractor shall provide exact cabling specifications to the Airports Authority. It shall be the Contractor's responsibility to provide and make the connection of the fiber optic cabling to their equipment. CDRL 115

M All fiber transceivers connected to end points provided by the Contractor shall be manageable.

N The CDMS shall track failed transmissions and provide diagnostic messages that include the SNMP message(s), the number of times transmission was attempted, and the assembly(s) affected. This information shall be retained for reporting, statistical analysis, audit, problem resolution, unit, and network "mean time between failures" rates.

O Wi-Fi or Cellular Components

1. Wi-Fi or cellular connectivity shall be utilized for the following devices to synchronize with the CDMS.
   a MLPI vehicle computers and handhelds
   b Handheld point-of-sale devices
   c Valet handhelds
2. Should the Contractor propose to utilize Wi-Fi for their system, they shall utilize an Airports Authority's Personnel to install, maintain and operate the Wi-Fi Infrastructure.

3. The Contractor shall submit the PARCS network architecture and protocol for Airports Authority review at the PDR and Airports Authority approval at the FDR. The architecture shall identify all devices in and out of PCI scope. CDRL 108
4. The Contractor shall be responsible for setting, connecting, and configuring the PARCS servers/workstations in co-ordination with the Airports Authority.

5.6 Database Requirements

A The Contractor shall maintain the PARCS database.

B PARCS operational and revenue service data is stored redundantly and redundancy shall be maintained throughout the PARCS.

C The Contractor shall provide procedures, documentation, and training to transition operations from the secondary system back to the primary and synchronizing data in the process. The Contractor shall provide details and information on the data redundancy scheme employed to the Airports Authority for review at the PDR and for approval at the FDR. CDRL 116

D Databases shall include redundant server system designs that support automatic failover and fail back procedures. The Contractor shall define the expected time taken to failover and fail back. The Airports Authority shall have final approval on the failover and failback procedure. CDRL 117

E Store, backup and maintain system, data and configuration files hosted on PARCS servers.

F The stored data shall be immediately accessible should a failover occur.

G All data from the various sub-systems shall be maintained in the main database on the CDMS by unique data fields. This shall allow the individual transaction data to be accessed by the following items, at a minimum, which shall be used for every PARCS transaction:

1. A unique ticket number for all entry media.
2. Transaction number.
3. Transaction type (regular and each individual exception type).
4. Entry or exit date and time (format shall be mm/dd/yyyy hh:mm:ss).
5. Discount type (e.g. promotions and validations).
6. Payment type (e.g. cash, check, bankcard, 3rd party app).
7. Equipment ID.
8. Lane ID.
9. Parking facility ID.
10. User ID.
11. License plate number.
12. Parking product ID.

H All data defined in Section 5.1.K shall be recorded in the PARCS database to allow the data to be easily extracted and exported.

I The CDMS shall store all data relating to the operation of the PARCS in one or more relational databases. The database manager shall support standard SQL/ODBC compliant commands and queries and database format.. .

J All data shall be stored in a format that complies with the Open Database Connectivity (ODBC) standard such that data may be exchanged as necessary with other similarly compliant applications.

K The Contractor shall utilize the RDBMS to configure all database tables, relationships, queries, reports, forms and automated data procedures.

L The Contractor shall submit the proposed RDBMS and supporting software for Airports Authority review and approval at the PDR. CDRL 116

M The Contractor shall supply the complete Entity Relationship Diagram (ERD) for the CDMS database, complete with data dictionary, for Airports Authority review at the PDR and for Airports Authority approval at the FDR. CDRL 118

N The Contractor shall allow access by select Airports Authority personnel to the system data dictionary.

O For all software implemented for the PARCS that collects, organizes, and stores data, the Contractor shall provide the Airports Authority with a Data Dictionary that textually and graphically details all data fields including their lengths, formats, and descriptions. CDRL 118

P A Data Table Map on standard AutoCAD (.dwg) or Visio (.vsd) formatted file showing the parent-child relationships between the tables and data elements shall be submitted to the Airports Authority in hard and soft copies for the Airports Authority's review and approval at the PDR. CDRL 119

Q The Contractor shall grant the Airports Authority read access to the entire CDMS database to permit the Airports Authority to extract data to be used in populating the Airports Authority's data warehouse.

5.7 Data Storage Requirements

A Maintain a rolling thirteen (13) months of live operational transaction data including the following information:

1. Entry/exit date and time.
2. Parking facility entry and exit lane identification.
3. Parking length of stay calculation.
4. Parking fee due.
5. Parking fee paid.
6. Payment method.
7. Bankcard details including bankcard type and authorization code.
8. Any other information considered part of the transaction.

B Maintain a rolling thirteen (13) months of License plate images.

C Maintain all transaction and revenue data for up to seven (7) years with simple retrieval capability as approved by the Airports Authority. Transaction and revenue data includes all data related to transactions and payments processed by the PARCS devices and third party interfaces.

D Maintain operational data for the prior seven (7) years with simple retrieval capability as approved by the Airports Authority. Operational data includes: occupancies, durations, lane volumes, lane closure date/time with cause for closure and equipment failures; the failed equipment component shall be identified by functional name, model number and serial number; daily event

log of exception transactions including date, time, parking area, lane, complaint or problem identification, and resolution.

E Maintain detailed event data for seven (7) years with simple retrieval capability as approved by the Airports Authority. The complaint or exception information shall be easily retrievable and software provided to assist an operator in building and maintaining a report/database of complaint and/or problem incidents.

F Maintain all transactions and summary reports for up to seven (7) years with simple retrieval capability as approved by the Airports Authority. The Contractor shall provide a backup/archiving system whereby reports are properly catalogued, such that historical data can be retrieved, added to new reports, or printed.

G The Contractor shall provide the Airports Authority with storage server requirements that provide the fault tolerant PARCS Central Servers' hard-disk capacity to have seven (7) years active data on hard disk along with software and other programs required to operate the system. CDRL 120

H License plate images for closed transactions shall be stored for ninety (90) days.

5.8 Data Backup and Archiving Requirements

A The Contractor shall perform automated data backups.

B The PARCS shall provide for the automatic archiving according to Airports Authority policy of all transaction data and critical core software to secure media without user intervention.

C The CDMS shall have a means for regular automated backup and archiving to separate secure storage media.

1. The backup process shall clearly define the appropriate verification, recovery, and restoration procedures, and clearly demonstrate a successful process without loss or duplication of data.
2. The Airports Authority prefers a Grandfather-Father-Son approach to be adopted.
3. There shall also be defined processes for automated data archiving. This process shall include both onsite backups for fast restoration and off-site backups for disaster recovery.

D The Contractor shall provide necessary details and information on the server backup system for the Airports Authority's review at the PDR and approval at the FDR. CDRL 121

5.9 Software Requirements

A The CDMS software programs shall be modular and structured. Software modules shall be able to be modified, recompiled, and replaced with a goal of isolating all affected changes to a specific function.

B Provide unique version identifiers for all downloadable software, data, and configuration files.

C The Contractor shall supply all necessary software applications and shall design and configure all application programs and the database for optimal system performance.

D The Contractor shall provide licenses for all third party software and core software in accordance with requirements stated herein. CDMS licenses and software shall permit no less than fifty (50) concurrent users. CDRL 122

E All user access to the CDMS shall terminate, and users logged out, after an Airports Authority-adjustable period of inactivity.

F The Contractor shall provide the Airports Authority a listing of all software applications and tools used within the CDMS for Airports Authority review at the PDR, and Airports Authority approval at the FDR. CDRL 123

G The CDMS shall allow control of designated system operational functions from remote locations.

H Software shall control and monitor system access, both for the system as a whole and its separate functions. All accesses shall be controlled, recorded, and reported to specific locations as identified within these specifications. Access privileges for individual users shall be settable by the system administrator. High-level security to associated files to ensure protection from unauthorized access, tampering, or transmission shall be provided.

I The Contractor shall provide appropriate software licenses as required for each of the software programs that have been developed or supplied off-the-shelf to operate the PARCS

J Software licenses shall include future updates during the warranty period as required by this specification.

K Custom software, integrations, and interfaces required by the Contractor to operate the PARCS shall be supplied to the Airports Authority with complete documentation and supporting flowcharts, data dictionaries and block diagrams. Source codes, including any changes, updates or patches during the post-warranty maintenance period, for the contractor's custom software shall be escrowed at the Contractor's expense and verified by a third party (code, compiler, tools, libraries and instructions) as specified within the Technical Specification. CDRL 124

L The Contractor shall demonstrate to the Airports Authority the degree of internal documentation within software code before placing in escrow. Any software tools, supporting files and/or documentation for making and changing the PARCS shall be provided in full. All escrowed software tools, supporting files and/or documentation shall be kept up-to-date with the latest upgrades and updates. A default escrow account shall be opened with the Contractor's default escrow agent for the purposes of this contract.

M The CDMS shall provide centralized distribution of updated definitions for the anti-virus and anti-malware application installed on all PARCS equipment. The CDMS shall receive and distribute such updates automatically; no manual action shall be required to distribute the updated definition files.

N All software updates shall be coordinated through the Airports Authority.

5.10 Change Management

A The Airports Authority shall provide the Contractor a Change Management Transition plan at the PDR that shall outline the impact to all relevant

Airports Authority individuals and teams from the implementation of the CDMS whether hosted onsite or offsite. CDRL 125. The Contractor shall be responsible for coordinating all efforts of the Change Management Transition plan.

5.11 CDMS Configuration Manager

A All configuration files and operational parameters of the PARCS equipment shall be managed by the CDMS. No change to these files or parameters shall be transmitted without a record of the change being stored on the CDMS. The CDMS shall store all changes made to files and parameters and allow for review of no less than the previous one hundred (100) changes made.

B Records of each change shall include the user, the date and time of change, the equipment to which change(s) was (were) transmitted and date and time of transmission. Contents of these files shall be protected by additional password privilege. Methods to alter configuration files and operational parameters shall utilize preformatted input forms supported by the relational database manager.

C The configuration files and operational parameters to be managed shall include at a minimum the following information:

1. Facility names.
2. PARCS equipment locations, identifiers and types.
3. Ticket and transaction types to be available for sale.
4. Ticket and receipt print format.
5. Customer display screen configuration and messages.
6. Operational parameters including timeouts, stock near-empty levels, accepted bill denominations.
7. Event and alarm descriptions, categories and priorities.
8. Cash handling device serial numbers in system.
9. Technician identification and access codes.

D The Contractor shall submit a comprehensive listing of system parameters, downloadable information and descriptions of procedures to track information modifications for CO review and approval at the FDR. CDRL 126

5.12 Security, Administration, and Compliance

A The Contractor shall adhere to the Airports Authority's CDMS security Policies and procedures.

B The PARCS applications shall have secured access. An appropriate password system shall be supplied by the Contractor. The Airports Authority shall have complete control to add to, delete from, or revise the passwords that are established by the Applications Administrator. Application access shall support the use of AD or other LDAP directories for login/logoff and support security protocols such as SAML, WS-TRUST for single sign on.

C The PARCS shall be compliant with the Airports Authority's network enterprise system and security requirements. Firewalls, gateways, encryption procedures and the like shall be described in detail during the

preliminary design review for the Airports Authority to evaluate the adequacy of the planned security features.

D The CDMS shall incorporate password policy that shall include the following programmable parameters:

1. Password Aging.
2. Minimum Password Length.
3. Enforce Password History.
4. Password Must Meet Complexity Requirement.

E The Contractor shall notify appropriate Airports Authority personnel within four (4) hours, by completing form Notice of Personnel Change, of any authorized support personnel that changed functional support responsibilities or terminated employment while still possessing valid user names and passwords to access the Airports Authority LAN/WAN infrastructure.

F The CDMS shall have appropriate security measures that are continuously active to prevent unauthorized intrusion to the operating system, applications, parameters, and other software modules, fully support PCI DSS requirements and support password protection to levels prescribed by the Airports Authority shall be implemented.

G A separate user account shall be provided to access system administrative functions to restrict access by application, by form and by function within form. Only administrators shall be able to get to forms that handle administration. With this, access shall be capable of being further restricted to what administrative functions can be perform, including inquire, add, change, and delete.

H The CDMS shall support maintenance of access level tables through a security administration function. These tables shall be used to establish employee and employee group access to PARCS devices, Network, CDMS, and data.

I Reports shall be available through the security administration function. At a minimum, these reports shall provide information on all users' access levels, access logs for logins, critical CDMS functions, maintenance activities, and all security violations or attempts.

J The Contractor shall provide a secure remote interface to the CDMS. The secure interface shall support only those designated personnel who are authorized to remotely interact with the PARCS Central Servers. CDRL 127

K Based on password/user ID security, any authorized user shall be able to download to any single piece of PARCS equipment:

1. Security access codes.
2. Rate changes.
3. Configuration files.
4. Operational parameters.
5. New and updated ticket layout and text.
6. New and updated customer display screen text.
7. Any other information necessary for the operation and maintenance of the PARCS equipment.

L Authorized users shall be able to select the date and time when any data download is to occur and to review and cancel any previously scheduled download.

M The Contractor shall close all unused portals for PCI compliance.

N Interface with the CDMS shall be limited through security and appropriate authentication and authorization mechanisms. Every interface with the CDMS shall contain safeguards (software and/or hardware) to prevent unauthorized intrusion and access to modification of data.

5.13 **Offline Requirements**

A The Contractor shall ensure that every PARCS device and system component shall be able to operate independently if the server system fails or there is a network communication failure. All devices and components shall be able to buffer and store at least one (1) day of typical Dulles Airport transactional data.

B Each device shall have its own processer and shall not share processors with other devices.

C Configurable option for the lane to automatically shut down device in the event of loss of communication (and display ‘Out of Service’) or in the event that the maximum offline minimum transaction threshold is reached the device shall remain shut down until reestablishment of communications.

D Whether in offline mode or no-power, all transactional data shall be stored or retained until power and/or communication is restored.

E In the event that a device is operating in off-line mode and on UPS power but the battery power is depleted, the device shall permanently store all transaction and bankcard information prior to shutting down. Devices shall automatically upload all transaction information including bankcard data to the Servers once communications is restored.

F In the event an offline condition occurs, the PARCS devices and components shall perform the following either during or after network connection is restored:

1. Continue to operate in offline mode until communication is restored.
2. Buffer transactions locally in the PARCS device before automatically uploading transaction data to the primary server once communication is restored.
3. Identify which transactions were not successfully uploaded to the primary server and remain stored at the local device.
4. Identify which offline bankcard transactions were not successfully submitted to the clearinghouse.
5. Identify which offline bankcard transactions were declined by the clearinghouse once communication was restored.

G The Contractor shall ensure the PARCS provides the ability to set a maximum value for bankcard acceptance when communication with the server or clearinghouse is temporarily lost.

H The Contractor shall submit documentation at the PDR explaining how LPR functions when there is a communication failure between the entry/exit lanes and when there is a server malfunction. The documentation shall explain how CDRL 128:

1. Transactions are processed when devices or servers are offline.
2. LPR entry and exit records are impacted.
3. LPR images and entry media are closed.

I For public lanes, it is preferable that the PARCS credential readers shall store real-time account status locally at each device. At a minimum, the PARCS access control credential reader shall check the credential facility code to allow or disallow entry during offline mode.

5.14 CDMS Disaster Recovery

A The Contractor shall design the CDMS to incorporate disaster recovery measures. This includes the establishment of a second, identical CDMS, to be deployed at the PARCS secondary site. Both instances of the CDMS shall be in constant communications via the PARCS LAN. Through this link, each CDMS shall be maintained as a mirror image of the other. The Airports Authority shall provide any infrastructure needed to connect both sites. The Contractor shall provide the disaster recovery plan for review at the PDR and approval at the FDR. CDRL 120

B In the event that the primary CDMS within the Airports Authority's PARCS Data Center is forced offline for any reason, all of the devices comprising the PARCS shall transition communications to the secondary CDMS located at the PARCS secondary site. This process shall be provided to the Airports Authority for review at the PDR and for approval at the FDR.

C The Contractor shall purchase and install all CDMS hardware (servers, switches, firewalls, etc.) and software (MS SQL Server, Oracle, Windows Server, etc.) and OEM (hardware, operating systems, relational database managers, etc.) for the Disaster Recovery Site.

5.15 Cloud Environment Requirements

A The Airports Authority prefers a cloud environment for development, testing, deployment, and ongoing operations to be provided by the Contractor.

B If a cloud environment solution is not available for during this project timeline, the PARCS shall operate on the existing PARCS fiber network, modified as needed for the proposed PARCS, and server(s) system that shall be provided/maintained/monitored by the Contractor..

C If the Contractor provides a cloud environment solution::

1. The system shall operate on the existing PARCS network modified as approved from the conditions assessment.
2. The network, servers, routers/switches, applications and databases shall be provided, maintained and monitored by the Contractor.

.

3. The Contractor shall be fully responsible for all CDMS requirements as defined in Section 5 of the Specification.
4. The cloud solution will be owned and managed by a hosting company which provides a dedicated Airports Authority environment protected behind a firewall.
5. The CDMS on-line cloud databases shall maintain a "five nines" (99.999%) availability for any single component or associated interface.

6. Redundant information shall be stored so that no subsystem failure shall compromise copies of the data

D The Contractor shall ensure that the cloud environment is fully PCI-DSS compliant including, but not restricted to the following requirements:

1. Securely built network
2. Proper protection of cardholder data
3. Maintained vulnerability management program
4. Ensure effective access control measures are in place
5. Ensure network is regularly monitored and tested
6. Maintain an information security policy

E The Contractor shall provide a plan to transition to cloud environment services during implementation and integration. CDRL 130

6 SYSTEM INTEGRATIONS AND INTERFACES

System Integrations and Interfaces identifies the integration and interface requirements related to items such as: Proprietary products, API's, and various PARCS equipment/components.

6.1 General Requirements

A The system provides tools to interface to proprietary products.

B System APIs shall provide real-time XML interfaces. Fields and data structures shall comply with a specified schema.

C APIs shall support security authentication of all clients invoking APIs so that each individual client is identified for each API call.

D The system shall allow for logging all requests and responses to and from the APIs.

E System APIs shall allow for the definition/registration, activation, and deactivation of access cards via a real-time API so that an external system with information about patrons can use the API to programmatically grant and revoke access to the garage.

F Vendor has technical specifications for Application Programming Interfaces (APIs). These specifications shall document each function that is exposed by the APIs. The documentation shall include each message that can be sent or received by the APIs down to the field level. This field level documentation shall include a description, example, and all restrictions on the field (ex: Must be text of up to 200 characters.)

6.2 Integrations

A The PARCS shall provide at a minimum the following integrated components:

1. LPR System.
2. MLPI System with supplemental handheld units.
3. Valet System
4. Access Credential Management System
5. Facility Monitoring System
6. Space Count System

6.3 **Interfaces**

A PARCS interfaces shall share PARCS data with other applications once every twenty-four (24) hours unless otherwise noted.

B The PARCS shall provide an API or file transfer of PARCS data for the other applications to pull into their systems. The Contractor shall provide the PARCS data in a standard format that can be received by the interfacing application. The Contractor is not responsible for modifying the receiving application software to receive the PARCS data.

C PARCS shall interface to the **following** MWAA Operational Systems and third party applications.

1. Airports Authority Customer Relations Management (CRM) System
    - a Provides tools to interface to Airports Authority Customer Relations Management (CRM) System.
    - b The following PARCS data shall be available for the interface:
        - i Transaction data - Entry date and time, exit dates/time, product purchased (hourly, daily, economy, prebooking products, etc.), payment amount, payment method (cash, bankcard, etc.)
        - i License plate data (not license plate images)
        - ii Registered parker information - Customer name, email address, mailing address
2. Airports Authority Business Intelligence Solution
    - a Provides a mechanism to allow for ETL tools to load data into Airports Authority Business Intelligence solution.
    - b The following PARCS data shall be available for the interface:
        - ii Transaction data - Entry date and time, exit dates/time, product purchased (hourly, daily, economy, prebooking products, etc.), payment amount, payment method (cash, bankcard, etc.). Data must be available to be pulled once every 24 hours with a configurable time.
        - iii License plate data (not license plate images)
        - i Occupancy data.
    - c Data will be provided by the PARCS and provided into a secure location which provides access for the MWAA systems to extract the data.
    - d Data format shall be in a standard format such as CSV, Database, or other file format to be determined and approved by MWAA.
3. Airports Authority Oracle Invoicing Interfaces
    - a Each month, provide PARCS ACMS employee permit data to the Airports Authority Oracle EBS-12 database so that invoices can be generated by the Oracle system.
    - b Each month transfer the payments posted from the Airports Authority Oracle system into the PARCS ACMS.
    - c The following data shall be available for the interfaces:
        - i From PARCS ACMS to Oracle for invoicing active credentials - account number, credential number, name, rate, amount due.

ii From Oracle to the PARCS ACMS for posting payments – account number, credential number, name, amount paid, period paid, payment date, payment method.

4. PARCS to the Online Parking Reservation System – See Section 14.
5. PARCS to Customer Loyalty Program – See Section 16.Real-time space count integration with the Airports Authority website – See Section 15.5.
6. Real-time space count integration with the Airports Authority mobile application - See Section 15.5.
7. Airports Authority bankcard clearing house, via a secure interface that is fully compliant with the PCI DSS.
8. Garage 1 and Garage 2 stacked space available signs – See Section 15.4.
9. Garage 1 and Garage 2 per level space available signs – See Section 15.4..

7 PAYMENT PROCESSING

Payment Processing defines processing for PARCS payment forms as well as adjustments and settlements.

7.1 Introduction

A The Contractor shall accommodate the following payment methods:

1. Cash and Checks.
2. Bankcards.
3. Access Credential tied to a bankcard (see ACMS section).

7.2 Cash and Check Payment Processing

A Cash and checks shall only be processed at a Cashier Station. The Cashier Station shall provide keys to select for cash and check payment. The Cashier Station shall be programmable so that cash payment is the default payment form i.e. when the amount tendered is entered into the Cashier Station and then the 'Enter' key is pressed, the transactions shall be recorded as a cash transaction. Change shall be calculated, if necessary, for all cash transactions.

7.3 Bankcard Payment Processing

A The PARCS shall accept major bankcard types (i.e. credit, debit and prepaid) and the following card brands - American Express, Discover, MasterCard, Visa and Diners Club for payment. For all approved bankcard authorization requests, the PARCS shall be capable of providing a bankcard transaction receipt with an optional signature line.

B The following types of bankcards/devices shall be accepted at all point of sale devices for parking access and payment (all cards/devices shall be processed without a PIN):

1. Magnetic-stripe bankcards.
2. EMV Chip bankcards
3. Contactless bankcards:

4. NFC-based payment from smart phones.

A The PARCS shall provide online real-time authorization for bankcard payments made at PARCS point of sale devices.

B For payments, bankcard information shall be read and transmitted to the bankcard processor/acquirer (“clearinghouse”). The clearinghouse shall provide authorization for all bankcard purchase transactions. The Contractor may utilize a third-party pre-processor subject to approval by the Airports Authority.

C At the end of each business day, as mutually agreed by the Airports Authority and the clearinghouse, the PARCS shall automatically provide necessary settlement data files.

D Software resident on the PARCS to accommodate electronic payments shall conform to applicable American Bankers Association International Organization for Standardization (ABA ISO) and the IEC, Federal Regulations (including Federal Reserve Board Regulations “E” and “Z”), and standards for electronic payment processing. All devices and systems that process electronic financial payments shall adhere to the applicable requirements of the financial services industry, such as the PCI DSS.

E All credit, debit, and contactless card acceptance hardware and software shall be Payment Card Industry Data Security Standard (PCI DSS) compliant and listed on the PCI Security Standards Council’s list of Approved PIN Entry Devices. All applications that store, process or transmit credit card information as defined by the PCI Security Standards Council will appear on the PCI Security Standards Council’s list of Validated Payment Applications listed at www.pcisecuritystandards.org/security_standards/vpa

F The PARCS shall comply with processing requirements for bankcard processing, including, but not limited to, applicable requirements and operating regulations of card brand associations, card issuers and clearinghouses.

G The PARCS preferred solution shall provide end-to-end encryption, however point-to-point encryption shall be accepted.

H As permitted by bankcard operating regulations, the PARCS shall provide settable parameters for bankcard transaction purchase amounts below which no customer signature is required.

7.4 Communications

A The bankcard server shall provide for communication with financial institutions (banks and/or clearinghouses) for the purposes of obtaining authorization to complete a transaction with a bankcard.

B The PARCS shall include a notification method of communication failures at any point in the data transmission from device to bankcard server to clearinghouse.

C The Contractor shall be responsible for development, testing and certification of the interface connection between the bankcard server, PARCS point of sale devices, and the clearinghouse.

D The Contractor shall provide all associated software and hardware for purposes of encrypting and transmitting the required data for determination of card validity and funds availability for approving (or rejecting) bankcard transactions initiated at PARCS equipment.

E The PARCS shall be able to simultaneously process bankcard transactions from all PARCS devices to the clearinghouse.

F All communications with financial institutions shall be ISO/IEC 8583 compliant.

G All communications network components and devices shall utilize end-to-end (i.e. from field device to clearinghouse) encryption or approved equivalent.

H The Contractor's interface shall provide for an approved commercially available encryption solution, as supported or approved by the Airports Authority's clearinghouse.

I The PARCS shall support the logging, storage, backup, and retrieval of information regarding all data transmissions, including timing of the transmission, data transmitted, and status of the transmission, for both individual transactions and entire files, such as settlement files.

J The future ability for the Airports Authority to add or change clearinghouses, including future ability to "direct connect" to one or more card brands for authorizations, shall be supported.

K The PARCS shall automatically accept files transmitted to the Airports Authority, from such institutions, including, but not limited to, bank settlement files, reconciliation files, Bank Identification Number (BIN) files, and other necessary files to ensure proper processing, accounting, settlement, and control for all bankcard transactions.

7.5 Funds Settlement

A The bankcard server shall generate an electronic settlement data file and transmission with the appropriate financial institution. .

B The PARCS shall uniquely identify each transaction revenue source in the settlement data:

1. PARCS bankcard deposits
2. Pre-booking website deposits
3. Third party sales channels (QuickPay, Parkmobile, etc.).

C The PARCS shall provide transmittal and report data that displays:

1. Bankcard revenue by source, parking product, individual parking facility or area and in total for a selectable time.
2. The data shall be able to be displayed by total for each card brand and grand total of all brand subtotals.

7.6 Payment Exceptions

A In all cases wherein a bankcard is read, the following most common exceptions may occur that require exception processing. The PARCS shall accommodate exceptions, including but not limited to:

1. Bankcard Not Found.

2. Unreadable Bankcard.
3. Bankcard Denials.

B The PARCS shall allow configurable messages to be displayed to the customer and the point of sale stations when a bankcard exception occurs.

C Regardless of the status of the transaction authorization, in all instances an inserted bankcard shall be returned to the customer.

7.7 Reversals

A The bankcard server shall automatically reverse bankcard authorizations whenever necessary because of a timeout, backout, or other transaction failure.

B If a customer uses a bankcard at entry and then backs out of the lane, the bankcard read shall not be not recorded in the database.

7.8 Refunds

A The PARCS shall allow an authorized user to process customer refunds through the PARCS from a PARCS workstation.

B The PARCS shall provide transaction detail for each refund including the date/time, workstation ID, user ID, refund amount, card type, and reason for the refund (available via a drop down box).

C The bankcard module shall produce reports showing refund transactions and grand total for a selectable time, by user ID, by reason, and by card brand.

7.9 Payment Card Industry (PCI)

A System shall be fully compliant with the Payment Card Industry Data Security Standards (PCI-DSS) version in effect at the time of the installation. CDRL 131

B System is a fully validated Payment Application that has been successfully assessed for compliance with the Payment Application Data Security Standard (PA-DSS) in effect at the time of the installation. CDRL 132

C The payment application is approved and listed on the PCI Security Standards Council (PCI SSC) website’s Application List. CDRL 133

D Point of Interaction (POI) devices (as defined by PCI) such as exit and pay-on-foot devices are approved on the PCI SSC website. CDRL 134

7.10 Bankcard Hot List

A The bankcard processing system provided by the Contractor shall maintain a list of bankcards that are known to be unacceptable due to past customer history and chargebacks as determined by the Airports Authority.

B The list shall reside on the bankcard servers provided, maintained, and monitored by the Contractor.

C The list shall be used to prevent such bankcards from being accepted by the PARCS.

D The Airports Authority shall be able to add and remove bankcards from the list.

E The bankcard server shall reject all requests for authorizations for bankcards that reside on the Bankcard Hotlist and inform the requesting device of the rejection.

F When a bankcard is on the Bankcard Hotlist, the bankcard server shall not request authorization from the bankcard clearinghouse.

G Only authorized users, under strict compliance with data security requirements, shall have the ability to add, delete, modify, and review entries on the Bankcard Hotlist.

H The Bankcard Hotlist shall have a capacity of no less than one thousand (1,000) cards.

I Each entry on the Bankcard Hotlist shall contain at a minimum the following:

1. The bankcard number in secured (i.e. masked or tokenized) format.
2. The date and time the entry was made or modified.
3. The authorized user who made or modified the entry.
4. The reason for the entry.
5. The most recent date, time, and location (device number) of attempted use.

J The Contractor may propose an alternate solution to block bankcards

7.11 Bankcard In/Out

A The PARCS shall provide the ability to use a bankcard in place of a paper ticket in a PCI compliant manner.

B The bankcard ticket functionality shall be configurable to be activated and de-activated by an authorized user only. Functionality shall be configurable by entry lane.

C The PARCS shall:

1. Issue a sequential ticket sequence number for each bankcard ticket. The bankcard ticket sequence number shall appear in the database and all reports in which a paper ticket appears and shall be traceable through the PARCS from start to close.
2. Accept validations for bankcard tickets.
3. Record the status of the bankcard ticket in the same manner as a paper ticket (i.e. open, closed).
4. Provide passback controls for bankcard tickets to allow only one (1) vehicle to enter on the same bankcard.
5. Shall allow an authorized user to look up a bankcard ticket based on the bankcard number while maintaining PCI compliance.
6. Allow the PARCS Administrator to reset a bankcard ticket status and remove the bankcard ticket from the PARCS.
7. A bankcard used at entry as a ticket shall be able to be used to pay for a paper ticket at exit and for an online reservation, even if the bankcard ticket status is ‘Open’.
8. Close the bankcard ticket status after a bankcard ticket exception transaction (unreadable, swapped) is processed.

9. Provide statistics on the number and dollar amount of bankcard ticket activity for a selectable time by lane, parking facility, or the sum of all parking facilities.

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8 REVENUE MANAGEMENT SOFTWARE APPLICATION

This section defines general RMS application requirements such as rate structure as well as virtual tickets, remote cashiering, discounts, exception transactions, customer transaction history, and input fields to replace paper forms.

8.1 Rate Structures

A The RMS shall allow the following rate structures, at a minimum:

1. Pay Per Use
2. Flat Rate
3. Rate Increments
4. Flexible Rates which can be:
    a Set by credential
    b Set by parking product
    c Set by parking facility
    d Set by area of a parking facility
    e Set by time of day, day of week
    f Daily rates
    g Weekly rates
    h Monthly rates

B The rate structures shall be configurable by the Airports Authority without need for a programmer to modify code and accommodate the following:

1. Unlimited number of rates.
2. Automatic adjustment for daylight savings time and leap year in fee calculations.
3. Twenty-four (24) hour maximums.
4. Grace period.
    a Provide a configurable Grace Period that has a zero (0) dollar charge for customers exiting within the grace period. These transactions shall be coded in PARCS as grace period transactions and shall be included in the Cashier Shift and Transaction reports.

5. Lag time period.
    a Provide a configurable Lag Time Period that has a zero (0) dollar charge for customers exiting within the lag time period. Lag time is defined as the time a ticket is paid at a POF station until the vehicle exits the parking facility.

8.2 Discounts & Promotions

A The PARCS shall be capable of providing the following discounts, at a minimum:

1. Full discount with no maximum.

2. Full discount with selectable maximums.
3. Fee discounts allowing a specified dollar amount to be subtracted from the total calculated parking fee.
4. Dollar value discount per time increment (i.e. discount per hour, per day, per week, etc.).
5. Percentage discount allowing a percentage to be deducted from the total fee amount.
6. Discounts that use a different rate to compute the parking fee.
7. Entry time discounts allowing an amount of time to be subtracted from the sequence of time intervals defined in the fee table, beginning with the entry time.
8. Exit time discounts allowing an amount of time to be subtracted from the sequence of time intervals defined in the fee table, beginning with the exit time.
9. Surcharge fees allowing a fixed fee that is charged in addition to the parking fee.

B Discounts can be issued with start and/or expiration dates. The RMS shall not accept discounts issued outside of the start and/or expiration dates.

C Discounts can be valid based on time and location restrictions.

D Each discount type/program shall have a unique identification number to track activity and discount values processed.

E PARCS shall accept, at a minimum, the following discount forms at all PARCS point of sale devices:

1. Encoded on dispensed paper tickets.
2. Chaser tickets
   a Both the chaser coupon and ticket shall be voided after exit is complete.
   b If a transaction is cancelled in the exit lane, the validated chaser coupon and dispensed ticket shall be returned to the user and shall not be voided.
3. Barcode and QR code printed on paper or presented on a smart phone.
4. Manually processed discounts using a key or code on the Cashier Stations, Remote Cashier workstation, Valet handhelds, and Roving Cashier handhelds (not required for an Exit Station) with no limit to the number of discounts configured.
5. Preferred but not required: E-validations where a discount is applied via a workstation or phone by entering the entry media number and discount code that is sent to the CDMS and applied to the entry media at exit.

F Discount Generator Software

1. The PARCS shall allow the Airports Authority and other approved users to create 1D barcode or QR code Promotional Discounts that can be printed, emailed to customers, published in 3rd party materials, and/or downloaded from an Airports Authority approved website.
2. Promotional discounts can be printed by the customer and/or downloaded to a smart phone by its customers.

3. Both the chaser coupon and ticket shall be voided after exit is complete.
4. If a transaction is cancelled in the exit lane, the validated chaser coupon and dispensed ticket shall be returned to the user and shall not be voided.
5. After a successful exit, the validation amount and type are recorded in the PARCS database for reporting purposes.
6. Provide a detail listing report and summary report of all validations created for a selectable start/end time. The report shall be sorted by user ID, Discount Production Unit ID, or discount/promotion/validation type.

7. Promotional discounts shall have the security features that prevent fraud including but not limited to:
   - c Discount generator shall provide a method to limit the user’s ability to print only one coupon per IP address within the coupon valid time.
   - d Discount shall be automatically read at PARCS point of sales devices.
   - e Discounts shall have a unique identification number that allows only one use per coupon.
8. Promotional discounts shall have a start and expiration date.
9. The PARCS shall provide configurable hard and soft promotional periods as follows:
   - a Hard promotional period - Customers must enter and exit the parking facility during the promotional period to receive the discount.
   - b Soft promotional period - Customers may enter and/or exit the parking facility for a selectable time before or after the promotional period and shall be able to receive the discount for all or a portion of the parking duration.
10. For customers who enter on or after the promotional start date but exit after the promotion expiration date, PARCS shall provide the following options:
    - a Allow all of the promotional value for the entire stay.
    - b Allow the promotional value only through the promotional expiration date.
11. The PARCS promotional discount shall allow the same value as the discount types provide by the PARCS prior to the expiration date or defined promotional period.
12. The PARCS shall allow each type of promotional discount to be assigned a unique validation account number so that the number of discounts generated and used at exit are recorded by the unique account number and reported in the same manner as other PARCS validations.
13. The PARCS shall allow the ability to input and process unreadable promotional discounts.
14. The PARCS shall have the ability to offer and track multiple promotions simultaneously.

8.3 Remote Cashiering

A The PARCS shall provide the following remote cashiering functionality, at a minimum:

1. Allows the following exception transactions occurring at Exit Stations to be processed at a PARCS workstation and records each exception type uniquely.
   - a Unreadable entry media
   - b Unreadable proximity card
   - c Swapped ticket
   - d Stolen ticket
   - e Unreadable POF
   - f Lost prepaid ticket
   - g Insufficient funds
2. Be capable of using at all lanes, including staffed lanes, to find an entry date when no license plate is matched at the exit by the LPR system.
3. Allows the remote cashier to find an entry date based on the LPI data and entry media number.
4. Once the entry date is found the PARCS automatically computes the parking fee and displays the fee at the exit lane device.
5. If an entry date is not found, Remote Cashiering allows the operator to input an entry date to compute the parking fee or select the lost ticket fee. The fee is automatically displayed at the exit lane device.

B After successful completion of the transaction, the entry media is automatically marked as 'closed' in the system.

C If a paper ticket paid at a POF unit is unreadable at exit, the Remote Cashiering shall allow the ticket sequence number to be input. The PARCS shall locate the POF payment data to complete the transaction and shall automatically compute and display any additional fees due at exit.

D Allows the operator to apply a discount to a parking transaction and input the reason for the discount in an input field with drop down menu.

E Records the different exception transaction types in the transaction database so that the type of exception transaction is displayed in the PARCS reports.

F Provides reports and accountability features per cashier ID on a shift basis so that data manually input by the remote cashier can be audited.

8.4 Remote Authorizations

A The PARCS shall provide remote approval for the following transactions:

1. ISF
2. Lost ticket
3. Long line discount

B The remote authorization can be entered at the Cashier Station by an authorized user or from a PARCS workstation.

C When a Cashier Station requests authorization, an alarm is sent to a PARCS workstation for the authorization.

1. The alarm includes the lane ID, cashier ID, and transaction information needed for the reviewer to determine if an authorization should be granted.

   a ISF - The total parking fee, fee paid, and fee applied to the ISF, along with the required customer data is displayed to assist the reviewer in granting an authorization.

   b Lost ticket – The customer driver's license number and license plate is displayed on the workstation for the reviewer.

   c Long lines – no additional information is required to be displayed for the reviewer.

D The remote authorization feature allows the request to be accepted or declined. If accepted the cashier may continue the transactions. If declined a message appears on the Cashier Station to call a supervisor.

E The user ID responding to the authorization request is recorded as part of the event.

8.5 Exception Transactions

A Exception Transactions are defined as any exit transaction that requires human intervention to complete the transaction including all validations.

B Exception transactions include, but are not limited to, the following:

1. Lost tickets.
2. Stolen tickets.
3. Backout tickets.
4. Unreadable entry media.
5. Unreadable POF prepaid ticket.
6. Swapped ticket.
7. Insufficient Funds Transactions. (See Cashier Station Section for processing description).
8. Towed and Impounded Vehicles - all towed and impounded vehicles transactions must be processed through a Cashier Station (See Cashier Station Section for processing description).

C Each exception transaction type shall be recorded as a unique type in the PARCS so that data by each exception transaction type is available.

D The PARCS shall provide the capability to report on all exception transaction data for a selectable time by transaction type, device ID, or user ID. See Section 17 for more information on Reports.

E Validations shall include the following:

1. Validations Encoded on Issued Paper Ticket – shall be processed at Exit Station or Cashier Station.
2. Separate Validation Chaser Coupon – shall be processed at Exit Station or Cashier Station.
3. QR code validations processed at Exit Station or Cashier Station:

   a Printed on paper

b Presented on a smart phone

4. Manual Validation - validation function keys on the Cashier Station or via Remote Cashiering.

F Following successful completion of each exception transaction, the ticket sequence number, whether manually entered or found by the LPR lookup, shall be automatically deleted from the active ticket inventory and marked as a closed ticket. The only case this shall not occur is for lost tickets with no LPI plate found or any time an LPI lookup occurs where the ticket sequence number is not entered by the cashier.

G All exception transactions shall be capable of being accommodated in series with other exception transactions (i.e. towed vehicle with lost ticket, lost ticket with insufficient funds, etc.)

H The Contractor shall provide an explanation of how such dual transactions affect transaction counts (both the mounted counters and system counts). CDRL 135

8.6 Input Fields to Replace Paper Forms

A The PARCS shall provide customer information input fields at Cashier Stations for desired data related to lost tickets, ISF transactions, and towed vehicle transactions.

B Customer information entered into the Cashier Station is stored in the database The customer information screen includes the following fields (selectable mandatory fields and masked unused fields):

1. Last Name.
2. First Name.
3. Driver’s License Number.
4. License Plate Number.
5. State of License Plate.
6. Date of Birth.
7. Home Address.
8. Phone Number.
9. Entry date and time (required if LPI is not available or is not found in the LPI database).

C The input data shall be retrievable and sortable by date, driver’s license number, cashier ID and transaction type.

D All input fields and drop down field selections used to process transactions at a Cashier Station, Remote Cashiering, and facility monitoring workstations shall be retrievable and sortable by field and drop down options.

8.7 Customer Transaction History

A The PARCS shall provide the Customer Transaction History to identify customers with frequent lost ticket, lost prepaid tickets, and ISF transactions based on the driver’s license number input for these transactions.

B The PARCS shall provide repeat occurrences to be displayed at the Cashier Station or PARCS workstation for these exception transactions. When an operator completes a customer information screen, the database searches by the driver’s license number for past occurrences.

C All past occurrences that match the criteria entered are displayed with the primary sort being the transaction type and the secondary sort being the transaction date, in descending order.

D Past occurrences can be configured to not appear beyond a selectable date/year.

E Past occurrences transactions can be removed from the active database for report generating to keep information manageable (if PARCS can generate reports for selectable dates, this is not needed).

F Display of past occurrences can generate an automatic alarm, an additional fee, or require a supervisor’s approval to proceed for occurrences exceeding a configurable threshold set by the Airports Authority or can simply be informational and handled outside of the PARCS.

G Provide an optional message for the cashier to contact management instead of displaying past occurrence history on the Cashier Station.

9 VALET SYSTEM

9.1 Valet System Requirements

This section defines the software and hardware requirements for the IAD Valet System operation.

A Fully integrated valet system to accommodate valet customers located at the Airports Authority’s existing valet parking facility in the Hourly Lot.

B A 360° vehicle camera imaging system to identify and document existing vehicle damage located at the gated entry lane into the Valet area.

C All data from the valet devices are reported to the CDMS in real time and included in the PARCS reporting. See Section 5.6.G for data detail.

D Central Cashier Stations to process customer cash, bankcards, and validation payments. The Central Cashier Station shall have the same requirements as the exit Cashier Station except gate features are not required. The Cashier Stations are located in the Valet Building.

E Handheld devices to check in customers and process customer bankcard payments. The handheld devices shall be able to do the following:

1. Require a user login.
2. Communicate to the PARCS from any parking facility via wireless network that has security measures to prevent unauthorized use.
3. Provide accountability of tickets issued and ticket payments processed.
4. Access data from the PARCS to assist customers in processing their transaction Automatically read the valet ticket.
5. Compute the parking fee.
6. Process a bankcard.
7. Issue a receipt.

F The handheld devices shall be integrated with the PARCS so that the payment data is transmitted to the CDMS and the ticket is marked as closed and cannot be used again.

G Feature that interfaces the valet system to the Dulles Airport flight database for notification of flight arrivals that result in alerting the system for vehicle retrieval.

H Feature to allow valet customers to text, call, or email their arrival information to alert the valet system for vehicle retrieval.

I Valet mobile application.

10 LICENSE PLATE RECOGNITION SOFTWARE APPLICATION

This section defines the LPR software application used at revenue entry lanes, exit lanes, and review workstations.

10.1 General Requirements

A Each public parking entry and exit lane at the Airports Authority shall be equipped with the License Plate Recognition (LPR) subsystem. The LPR subsystem shall consist of all hardware and software necessary to provide a complete license plate reading subsystem that does not adversely affect any function of the PARCS. The Contractor shall be responsible for providing an LPR subsystem that is fully integrated with the PARCS.

B All entry and exit transactions shall utilize LPR. The PARCS shall allow the Airports Authority to deactivate LPR functionality for any select entry media type.

C All LPR subsystem processing shall occur in parallel with other functions occurring within the PARCS and shall not increase the processing time for vehicle entry.

D In the unlikely event of total LPR subsystem failure, it shall be possible for the Airports Authority to “turn off” the LPR subsystem so that continued normal operation of the base PARCS is maintained. This normal operation of the base PARCS system shall not require patrons to wait for the expiration of an LPR related timeout to process their transaction. Once the LPR subsystem comes back online, the Airports Authority shall have the ability to “turn on” LPR functionality.

E LPR shall utilize post capture configuration, meaning the license plate images are taken after the vehicle has cleared the entry lane closing loop.

10.2 LPR Database

A The Contractor shall provide the Airports Authority with a License Plate Database (LPD) for data captured by the LPR subsystem with the following features:

1. Accommodate all Airports Authority public parking facilities. Separate inventories are required for each separate facility or zone as provided in the SCS. Combined summary of LPD of all facilities shall be required at CDMS.
2. Provide a backup LPD solution with software and sufficient capacity to automatically backup current LPD at programmable time each day from computer and store for one (1) year.
3. Provide up to eight (8) alpha-numeric digits to be stored in database in addition to state designators.

B The LPR database shall be the primary database to process exits and exception transactions. The MLPI database shall be the secondary database used when the LPR database is unsuccessful in matching the LP at exit and/or providing an exit date for the transaction.

C The databases shall purge orphaned LP's after a programmable number of days.

D The Contractor shall explain how the LPR and MLPI databases interact concerning adding, merging, and removing data.

E Image Review Workstations (IRW's) shall provide an operator the ability to review images, input correct entry LP data, input exit LP data to search the LPR and LPI databases for entry data associated with an exit LP.

F The image routing shall be configurable based on Authority needs. The system shall accommodate the following routing scenarios at minimum:

1. All images routed to a single IRW.
2. All images are first sent to a single queue and then sent to the next available IRW.
3. Images are routed to specific IRW based on the facility of the transaction.

G Exit transactions shall be given higher priority than entry transactions for review at an IRW. A vehicle may not exit until the entry review alarm has been processed or the alarm timeout period has been reached.

H Provide images of the license plate and also a broader image that includes the full back view of the vehicle.

I Provide the ability to zoom images at the IRW.

J Send alarms to the IRW when the following events occur:

1. Entry plate not successfully read. A successful read is one that meets the performance criteria defined in this section.
2. Exit plate not successfully read.
3. The entry record data does not agree with the exit record data. (A record includes the plate image and media data)."
4. Programmable alarm timeout period shall be processed based on the entry time of the entry media presented and the transactions shall be recorded as a Timeout transaction in the PARCS.

10.3 **Exception Transactions**

A Record each type of LPR exception transaction so that they are uniquely identified and sortable by type for reporting purposes.

B No Plate Found on Entry - During an entry LP review, if the entry LP image is not available to input into the IRW, the PARCS shall record the image as a 'No Plate on Entry' and shall link it to the entry media to create an entry record that shall be stored in the PARCS database.

C Multiple Entries - During an entry LP review, if the entry LP image is already in the database the IRW shall alarm and display the images and related entry data of the duplicate entry. The operator shall confirm the duplicate entry and the system shall remove the oldest entry record from the system and record the entry record as a Multiple Entry transaction.

D No Plate Found on Exit - During an exit LP review, if the exit LP image is not available to input into the IRW, the PARCS shall record the exit LP image as a 'No Plate on Exit'. The PARCS shall use the entry media date/time presented in the exit lane to compute the parking fees. The transaction is processed and recorded in the PARCS database as a No Plate Found on Exit transaction. The LP entry image and associated entry media used at exit are closed in the PARCS database.

E No Plate Match – During an exit LP review, if a matching entry image is not found, the PARCS shall search the License Plate Inventory (LPI) database for a match. If a match is found the fee is automatically computed and is based on the LPI entry date. If a match is not found in the LPI, the PARCS shall allow a configurable option to charge a fee based on the entry media presented or charge the Lost Ticket rate.

F Swapped Media – A Swapped Media transactions occurs when the entry media presented at the exit does not match the entry media recorded for the LP that is in the exit lane. The following processes shall be provided for Swapped Media transactions.

1. A Swapped Media alarm shall be sent to the IRW. The IRW shall display the entry image and entry media sequence number and the exit image and entry media presented at exit. If the operator confirms that the exit LP image was correctly captured, the entry media date/time associated with the LP in the exit lane shall be used to compute the parking fee. The transaction shall be processed and recorded in the PARCS database as a Swapped Media transaction. The exit LP image and the entry media associated with the exit LP shall be closed in the PARCS database.
2. If the entry record for the LP at exit is not found, the PARCS shall allow a configurable option to charge a fee based on the entry media presented or charge the Lost Ticket rate.

G Timeout Transaction - An exit alarm remains on the IRW until the programmable timeout period occurs. If an exit LP is not reviewed within the timeout period the PARCS shall use the entry media date/time presented in the exit lane to compute the parking fees. The transaction shall be processed and recorded in the PARCS database as a Timeout transaction. The LP entry image associated with the entry media used at exit are closed in the PARCS database.

H Unreadable Entry Media – The device shall return the media to the customer and instruct customer to press the intercom.

I Stolen Paper Ticket – The device shall return the ticket to the customer and instruct customer to press the intercom.

10.4 Blocked List

A The LPR subsystem shall maintain a Blocked List of the following:

1. License Plate Numbers (LPNs) which identify vehicles whose owners have a history of problems at the facility.
2. LPNs of vehicles movements that is necessary to track as decided by the Airports Authority.

B Upon entry of any vehicle with a LPN on the Blocked List, the LPR subsystem shall sound an audible alarm in the Parking Office until

acknowledged by an operator. The audible alarm sound corresponding to the LPN's on the Hard Blocked List shall be a unique sound used only for this purpose.

C The Blocked List either may reside on the PARCS or on the LPR subsystem as determined appropriate by the Contractor.

D Entry of LPN's onto the Blocked List shall be controlled by user ID and password. LPN's shall reside on the Blocked List until removal by the Airports Authority. Entry of an LPN onto the Blocked List shall include the date of entry, reason for entry onto the Blocked List, authorizing supervisor, and comment section.

11 MOBILE LICENSE PLATE INVENTORY SOFTWARE APPLICATION

This section defines the software application used to support customer vehicle location and entry date for lost/unreadable tickets should the LPR not have this information.

11.1 General Requirements

A The Airports Authority requires an overnight Mobile License Plate Inventory (MLPI) system that uses LPR cameras mounted to Airports Authority-provided vehicles to capture license plates parked in the parking facilities. The MLPI data shall be used as a secondary look up for exit exception transactions to assist in the calculation of parking fees and shall provide vehicle locations for customer assistance.

B The Contractor shall provide equipment and software modules to complete the overnight inventory process within a four (4) hour time window. This time window includes the inventory taking process, correction cycles, and generation of an updated current overnight inventory.

C At a minimum, the Contractor shall provide the following - the MLPI vehicle unit shall alert the driver of LP's that are not accurately read (below the defined confidence factor). The MLPI unit shall display the actual LP image on the computer, show the LP number captured by the camera, and allow the driver to input the correct LP number into the computer.

D At a minimum, the Contractor shall provide the following - the MLPI computer shall alert the driver when no LP is captured. The MLPI unit shall display the actual LP image on the computer and allow the driver to input the correct LP number into the computer,

E At a minimum, the Contractor shall provide the following - the MLPI computer shall upload the collected inventory data to the server each night and download the most recent information from the server to the vehicle MLPI computers and handhelds before taking the nightly inventory.

F The PARCS shall track reappeared vehicles so that if a license plate is recorded for night #1, disappears for night #2, and then reappears in the same parking space for night #3 it assumes the vehicle has parked for all three nights and records the night #1 entry date in the database.

G The Contractor shall provide the success rate of Maryland, Virginia, and Delaware license plate reads from an installation that uses the proposed LPR system.

H The MLPI device's software shall record the beginning and ending dates/times for the inventory taking process for each unit and shall cause these to be recorded on the Daily Event Log each time that the uploading process begins.

I The MLPI software shall be capable of receiving zone data from multiple devices.

J The MLPI software shall allow for correction of mistakes made during inventory collection process. Inventory personnel shall be able to delete any specific license plate entry.

K The MLPI software shall default to state of majority of license plates.

L The MLPI software shall be provided with changeable defaults for facility, section, and row. Inventory personnel shall not be required to enter facility, section, or row for each entry. Inventory personnel shall change facility, section, and row defaults as appropriate during inventory process.

M The MLPI software shall be route-specific but system shall be easily modified and altered using GUI capability to reflect changed parking configurations.

11.2 License Plate Database

A The Contractor shall provide the Airports Authority with a License Plate Database (LPD) for data captured by the MLPI subsystem.

B Accommodate all Airports Authority public parking facilities. Separate inventories are required for each separate facility or zone as provided in the SCS. Combined summary of LPD of all facilities shall be required at CDMS.

C Provide up to eight (8) alphanumeric digits to be stored in database in addition to state designators.

D Once an LPN has been used to process a transaction, the LPN shall be extracted from an active inventory database and placed in an inactive inventory database.

11.3 MLPI Functional Requirements

A Allow manual entry and editing of records via the workstation.

B Exportable to the CDMS on a daily basis via a Contractor provided interface.

C Allow query by license plate number to determine location of lost vehicle.

D Retain data concerning plate numbers that disappear from LPD in separate file until next inventory update. Those vehicles that do not reappear, in the same location upon the next update, shall be deleted.

E Provide equipment and software for uploading data from MLPI collection to LPD with error checking protocol.

F Capable of receiving zone data from multiple devices.

G Allow for correction of mistakes made during inventory collection process. Inventory personnel shall be able to delete any specific license plate entry.

H Default to state of majority of license plates.

I Provide changeable defaults for facility, section, and row. Inventory personnel shall not be required to enter facility, section, or row for each entry. Inventory personnel shall change facility, section, and row defaults as appropriate during inventory process.

J The MLPI software shall be route-specific but system shall be easily modified and altered using GUI capability to reflect changed parking configurations.

11.4 MLPI Procedures at Exit for Exception Transactions

A If the LPR is unable to determine an entry date for an exiting vehicle, the PARCS shall search the LPI database for the license plate. If the license plate is found in the LPI database the parking fee shall be automatically computed using the LPI entry date

12 FACILITY MONITORING SYSTEM

This section defines equipment monitoring, system alarms, equipment activation functionality, and event log, which records all system events.

12.1 General Requirements

A The PARCS shall provide an online, real-time Facility Monitoring System (FMS) that performs the following four (4) primary functions at a minimum:

1. Equipment Monitoring - provides the status for each device and PARCS component.
2. System Alarms - notifies via selected alarms of device equipment status either online or offline and problem reporting.
3. Event Log - records PARCS activity and assigns each event a unique code so that event frequencies can be found.
4. Equipment Activation Functions - used to operate devices remotely from the FMS workstation.

12.2 Equipment Monitoring

A The FMS shall be a network of computers and servers that provide on-line monitoring and control of all PARCS equipment and parking events.

B The FMS shall also use individual and/or multiple software packages.

C All workstations shall have FMS software shall have a GUI for ease of use.

D The FMS shall monitor the following operational status of each entrance lane and display:

1. Lane status: open or closed
2. Gate failure
3. Gate stuck up
4. Low-ticket supply
5. Jammed ticket
6. Illegal exit - reverse direction through lane
7. Stolen ticket
8. Backout

E The FMS shall monitor operational status of each exit lane and display:

1. Lane status: open or closed
2. Gate failure
3. Gate stuck up
4. Illegal entrance - reverse direction through lane
5. Backout
6. Low receipt paper supply

12.3 System Alarms

A An alarms function shall allow the user to select which events to alarm.

B Alarms can be displayed on a workstation or sent to an authorized user via email or text message.

C Abnormal status conditions shall be flashed on monitor(s) and accompanied with an audible alarm.

D Display shall continue to flash until abnormal condition is corrected. Audible alarm shall continue until it is turned off by a command issued from a PARCS monitoring workstation(s).

E Acknowledgement and turning off any alarm condition shall be able to be performed at any workstation with access to FMS.

F It shall not be necessary to acknowledge alarm condition at every workstation.

G The FMS shall record abnormal status condition and acknowledgement of alarm condition by time, workstation and operator.

H Authorized users shall see and be able to manage alarms.

I Alarms shall be selectable as visual, audible, or both.

12.4 Event Log

A The FMS shall record all system events that can be viewed on a workstation or printed.

B The FMS shall record the specific information and details for changes to system configurations including type of change, date/time, and user ID.

C The FMS shall provide the ability to sort the events by activity code facility, and/or device ID.

D The FMA shall provide the sum total of sorted codes (i.e. how many occurrences there were for the selected code).

12.5 Equipment Activation Functions

A The FMS shall allow the following functions to be performed from a workstation:

1. Turn on/off lane signage (if applicable)
2. Device in/out of service
3. Open/close a barrier gate
4. Barrier gate vend – barrier gate opened at FMS and closes when vehicle crosses the closing loop.
5. For barrier gate open/close and vends
   a Provide a drop down field to select up to six (6) Airports Authority-defined reasons for a remote barrier gate vend.
   b Remote barrier gate vends made from workstations shall the record location, time, user ID, and reason for barrier gate vend.
   c Manual gate vends made locally at the lane shall be recorded as an event in the Event Log and assigned a unique code different from remove gate vends.
   d PARCS shall provide the total number of remote and local gate vends by facility, lane, or user ID for a selectable time.

13 ACCESS CONTROL MANAGEMENT SOFTWARE APPLICATION

This section defines the credential management system used for employee and tenant permit parking but also can be used on pay-per-use for public programs. Systems include account administration, auto payments using a bankcard on file and an invoicing package.

13.1 ACMS General Requirements

A The Contractor shall provide a fully integrated Access Control Management Software (ACMS) application that allows the Airports Authority to issue access credentials to Airport vehicles, Airport employees, Very Important Persons (VIPs), and other users as specified by the Airports Authority.

B Provides the following rate structures, at a minimum:

1. Flat rate with unlimited in/out privileges:
    - a With no restricted day/times
    - b With restricted day/times
    - c Apply flat rate/penalty for use during restricted times
    - d Apply variable rates for use during restricted times
    - e Accounts with a limited number of credentials allowed in the parking facilities at one time. Access is blocked for account credentials exceeding the allowed number or access is allowed and contracted rates are charged for credentials exceeding the allowed number.
2. Variable rates for pay-per-use credentials with same rate structure requirements as the RMS.
3. Off-peak vs on-peak pricing.

C The ACMS shall manage the life-cycle of an individual credential, beginning with the credential inventory, credential issuance, and ending with the deactivation or replacement of the credential.

D The system requires PARCS users to enter authentication information (login/password).to access the system.

E The ACMS database shall be fully integrated with the PARCS, so that under normal operations, the PARCS can activate and deactivate an Airports Authority-issued access credential and block lost or stolen credentials from further use.

F The access credential activation, deactivation, and blocking shall be recognized in the lane within two (2) minutes of performing such action at the PARCS workstation.

G The Contractor shall transfer all active account data from the current system into the ACMS database.

H The Contractor shall provide AVI readers that can read the TransCore eGo Plus transponders currently used on Airports Authority vehicles.

I Access credentials used for ACMS shall include:

1. Proximity cards for Dulles Airport employees and VIP’s.

2. AVI transponders compatible with TransCore E5 readers and AA3152 antennas for Airport vehicles and for parking shuttle buses.

J The ACMS shall consist of the following components provided by the Contractor:

1. Proximity card readers and TransCore E5 readers and antennas for entry and exit lane as designated in the PARCS Base Bid Equipment Matrix (see Appendix A).
2. Five (5) ACMS user licenses.

13.2 ACMS Operating Functionality Requirements

A Securely activate and personalize an Access Credential.

B Allow authorized users with computer (via a browser) to create accounts and activate/deactivate credentials.

C Provide a minimum of three (3) separate authorized access levels for (1) account management and credential activation/deactivation, (2) look up credential activity and/or reset credential status, and (3) payment postings.

D Allow account settings to be changed for a credential.

E Retain credential account and activity history after the credential is deactivated and re-issued to a different user.

F Provide ability to have master accounts with sub accounts.

G Set access restrictions by facility, master account, sub account, and individual credential for time of day and day of week parameters.

H Provide passback functionality with three settings as follows:

1. Neutral Passback – allows access regardless of in/out status of the access credential.
2. Hard Passback – does not allow entry/exit if access credential in/out sequence is violated and records the passback violation in the system and in a passback violation report
3. Soft Passback – allows entry/exit if access credential in/out sequence is violated and records the passback violation in the system and in a passback violation report.

I Assign passback setting (neutral, hard, or soft) by master account, subaccounts, individual credential, and by facility.

J Provide the ability to reset the access credential status for individual access credentials, by group, and by facility.

K Interface with PARCS to check credential validity at the time of entry.

L Record all card usage including the lane ID, entry/exit date/time, credential number, and passback status.

M Generate a record of all activity related to a master account or an individual credential in the CDMS database for a selectable time.

N Provide automated notification to the permit holder and the Airports Authority of the following information:

1. Fee due dates
2. Past due amounts

3. Annual renewals
4. Upcoming expiration of bankcard(s) held on file

O Troubleshoot faulty credentials. Allow quick look-up the credential status, credential lane activity and payment history to determine if the gate is not vending due to passback violation, inactive status, or payment issues.

P ACMS software shall have, at a minimum, the following data input fields available for each credential account:

1. Unique credential number.
2. Customer ID number.
3. Account number.
4. Credential holder name.
5. Credential validity period.
6. Credential holder organization.
7. Credential holder department.
8. Credential holder telephone number.
9. Credential holder email address.
10. Parking privilege code(s).
11. Credential fee/rate.
12. License plate number.
13. Driver's license number.
14. Vehicle ID number.
15. Vehicle make/model.
16. Spare 1.
17. Spare 2.

13.3 ACMS Invoicing Requirements

A Full accounting functions including account generation, tracking, invoicing, and account payment collection.

B Provide an invoicing package for parkers to prearrange billing. The invoicing package shall be capable of collection of fees from parkers on monthly prepayment, end of month billing, and/or bankcard basis.

C Provide invoicing for parkers that pay a fixed fee for unrestricted parking for a specified duration (week, month, quarter, and year). Invoice generation shall be available for the same durations (i.e. weekly, monthly, quarterly, or annually).

D Provide invoicing for ACMS parkers that pay per use. Charges may be equal to or different from the standard parking fees for each facility.

E Provide invoicing that allows a flat fee charge plus pay per use for ACMS parkers. The flat fee charge may be for a week, month, quarter, or year).

F Provide automated bankcard charges using the ACMS parker's bankcard on file. Automated bankcard charges shall be available for fixed fee and pay per use customers. The invoicing package shall automatically send an electronic receipt via email to the customer each time the bankcard is charged.

G Provide for positive posting of payments and automatic lockout of users within programmable grace period after expiration of prepaid account.

H Issue an itemized statement of charges processed for that user.

I Provide automatic account blocking if payment is not posted by nth day of the month.

J The invoicing package shall include Accounts Receivable functionality to handle all normal accounting functions associated with ACMS revenue. Package shall include such functions as invoice report, cash receipts journal, accounts receivable ledger with supporting subsidiary ledgers for each account, accounts receivable aging report for selectable time periods, and account history reports, indicating invoices and payments by customer.

K Provide a method to compare the number of active permit credentials (excluding free credentials that are not invoiced) to the number of permit credentials invoiced each month. CDRL 134

14 PRE-BOOKING PARKING RESERVATION SYSTEM

This section provides requirements for an online public parking reservation system that includes demand based variable pricing and yield management tools which interfaces with PARCS.

14.1 General Requirements

A The Contractor shall provide an online prebooking reservations system (PRS), fully integrated with the PARCS.

B The PRS shall provide reservation, variable pricing, and yield management tools.

C Once the new PARCS is installed, the Prebooking Reservation System (PRS) shall interface with the PARCS application, at a schedule agreed to by the Airports Authority.

D The PRS parameters shall provide sufficient flexibility to be configurable to meet the Airports Authority's current and future needs.

E The PRS shall operate in all staffed and unstaffed PARCS-configured lanes.

F The PRS shall be fully implemented as a web interface that allows the Authority to use all its functionality from a browser regardless of geographical location.

G The Contractor shall host the PRS website to have the 'look-and-feel' of the Airports Authority website. The Contractor shall provide access to the Airports Authority to the back office management system via a unique and secure URL for both the test and Production environment. The Airports Authority shall have the option to embed this URL into its intranet website.

H The bankcard payments for the PRS shall be processed through the Contractor's hosted server.

I The Contractor shall provide access to the Airports Authority to the back office management system via a unique and secure URL for both the test and Production environment. Back office management system refers to all functions available to owner to use.

J The Airports Authority shall have the option to embed this URL into its intranet website.

K The PRS information security provisions shall be equivalent to the PARCS.

14.2 Customer Features

A An online user web interface tool to reserve, modify, cancel and pay for a parking space.

B The web interface tool shall allow customers to select travel dates and display parking options, features and rates for multiple facilities.

C The PRS shall allow customers to manage their account information online.

D Once a reservation is successfully created, the reservation transaction details are sent via a secured connection to the PARCS.

E Upon successful completion of an online reservation, a printable or electronic confirmation of the reservation shall be made available and sent via HTML email to the customer.

F The PRS shall interface with the Airports Authority's website as follows:

1. Customers shall access the PRS by clicking on a link embedded in an approved Airports Authority website, for example www.mwaa.com. This shall be within a frame located on the website where the customer can enter their travel dates and click a button to "Reserve Parking.
2. After the customer has chosen reservation dates, entered an optional promotion code and any other details optionally required by MWAA, processing shall be directed to a non-Airports Authority hosted site where the transaction shall take place.
3. Upon successful completion of the transaction, the customer shall automatically be directed back to the Airports Authority's originating webpage. "

G The PRS shall have an option to access the hosted site using a smartphone application to:

1. Make a new reservation.
2. Check the status of an existing reservation.
3. Modify an existing reservation.
4. Cancel a reservation.

14.3 PARCS Integration Features

A The PRS shall communicate online reservation activity to the PARCS in real-time.

B The PARCS shall recognize the reservation upon entry and exit to the Airports Authority's designated parking facility via the following read methods and shall compute the correct charge at exit:

1. Bankcard – See Payment Processing section.
2. QR code – Presented on paper or a mobile device.

C The PARCS shall enable verification that a customer has made a valid pre-payment to allow customer access to the selected parking facility.

D The PARCS shall automatically compute parking fees for overstays beyond the pre-paid reservation period.

E The PRS shall interface with the PARCS SCS. The PARCS SCS shall have a count field for reservation vehicles that increment each time a reservation credential is presented at entry and decrements each time a reservation transaction exits the parking facility.

F For customers who fail to show up for their reservation, the system removes the reserved space from the PARCS SCS upon the expiration date of the reservation.

G When reservations are used, the PRS shall send details back to the PARCS system in order to allow the Airports Authority to analyze facility usage statistics.

14.4 Payment Processing

A All of the payment and reservation processes shall occur on the Contractor's approved designated hosted website.

B The Contractor is responsible to ensure that all operating, payment, installation, and reporting processes meet the latest PCI DSS compliance requirements.

C The PRS shall be fully certified to the latest PCI DSS requirement standards.

D The PARCS shall be capable of exporting all check-in and check-out transactions as part of its 'End of Day' process and facilitate the transfer of this data to the PRS for import via a secure method.

E The PRS shall process online payments as follows:

1. When reservations are made, the host system shall send transaction data to the Airports Authority's bankcard service provider.
2. PRS payments shall be processed using online authorization of the customer's bankcard for transaction approval.

F The PRS shall deposit a nightly sales revenue batch transfer into the Airports Authority's financial institution account at a pre-designated time agreed to by the Airports Authority.

G Detailed transaction data, along with daily totals (by product type, bankcard type and parking facility) shall be available to the Airports Authority to allow sales to deposit reconciliation.

14.5 Management Features

A The Airports Authority representative shall have the ability to enter reservation details into an Airports Authority workstation to locate a parking reservation.

B The PRS shall have the ability to print a daily reservation list sortable by last name, reservation number, license plate number, or driver's license number.

C The PRS shall have a method of removing a parking reservation from the PARCS once it is manually processed at entry.

D The PRS shall provide options for the Airports Authority to allow partial refunds, full refunds or no refunds for cancelled reservations within selectable days before the arrival date.

E The PRS shall be user-friendly and configurable by the Airports Authority to include, but not limited to, setting multiple rates, products, promotions (including promotion codes), and spaces available for a reservation.

F Airports Authority staff shall have full control (subject to user permissions) of defining all parking products, with the associated business rules and policies required, and control to implement in real-time the most flexible rates associated with these products.

G The PRS shall provide the Airports Authority with the capability to add or remove parking facilities and/or lanes of equipment to the PRS solution set-up.

H The PRS shall allow the Airports Authority to set multiple rate tables.

I The PRS shall allow multiple promotions for each parking facility with start and end dates.

J The Contractor shall allow rate card table data to be downloaded to the PRS directly from Excel format.

K The Contractor shall allow for Production rate cards and rate card indicators to be editable by Airports Authority-approved staff.

L The PRS shall allow an administrator to make changes to reservations on behalf of a customer.

M The Airports Authority shall have access to the PRS data records to view and export into the Airports Authority's applications.

N The PRS shall allow the Airports Authority to send emails and reminders to customers.

O The PRS shall provide an integrated operational and price management system with reporting capabilities.

P The PRS shall allow the Airports Authority to offer upgrade products and bundling at the time of the reservation and send HTML emails at a configurable period prior to the arrival date.

Q The PRS shall allow the Airports Authority to collect customer information for marketing and email campaigns.

R The PRS shall be able to use promotion codes to apply discounts and track sales channels.

S Codes can expire by date or by entry date and time (i.e. all entering by a specified date shall receive the promotion regardless of exit date.).

T The Contractor shall provide the Airports Authority with unique hyperlinks for third parties and travel agents that can access specific products at special prices.

U Third parties shall have the ability to monitor product sales and make reservations on behalf of customers.

V The PRS shall allow the Airports Authority to publish rates to third parties and also receive rates from external yield management systems.

W The PRS shall allow the Airports Authority to sell other products such as fast track security, lounge passes, and other products and services through the website and third party channels.

X The PRS shall allow for the collecting and reporting relevant data on competitors including off-airport parking operations, hotels.

15 SPACE COUNT SYSTEM

This section provides requirements for facility space counts by area and by floor and interfaces with local signage, the IAD website, and a mobile app.

15.1 General Requirements

A The Space Count System (SCS) shall serve as an operational tool for maintaining a current count of the number of available parking spaces within each parking facility, area, and level of each garage as well as the overall counts for each facility as a whole.

B The SCS shall consist of vehicle detection equipment located on each garage level and each entry/exit lane for detecting vehicular movements relative to entering and exiting a parking facility and/or level.

C This section describes ground loops as the vehicle detection technology. The Contractor may propose other technologies for vehicle detection that provide an equal or better performance than ground loops.

D "Vehicle Count" shall be the specific event when a vehicle is detected and counted when entering or exiting a parking level or facility's control points. "Spaces Available" is defined as the spaces remaining in any given area resulting from the number of vehicle counts affecting the availability of any specific area within the parking facility.

E The vehicle count inputs shall be transmitted to the CDMS that shall process the data on a real-time basis. The processing shall consist of adding, subtracting, and comparing the respective vehicle counts against a predetermined number of parking spaces available within each parking level of the garage. The purpose is to determine the actual number of vehicles parked on each parking level or area, or conversely, to establish the number of available parking spaces.

F For each parking facility, the PARCS shall receive input counts from a designated vehicle detection device at each entry lane. As a vehicle enters the parking area, the vehicle's entry movement shall be detected and cause a signal to be dispatched to the SCS. The SCS shall record the event and decrement by a count of one the number of parking spaces available within the facility. At an exit lane, the vehicle's movement through an exit lane shall be detected by a designated exit lane vehicle detection device and increment by a count of one the number of available parking spaces within the parking facility. Directional logic shall be employed to detect illegal entries, exits, and backouts and shall increment and decrement correctly for entry and exit lanes.

G Vehicle's movement on a ramp between parking levels shall be detected by the vehicle detection device. The vehicle's movement shall cause a signal to be dispatched to the SCS. The PARCS shall decrement/increment by a count of one (1) the number of parking spaces available within the level just entered/exited and adjust the Parking Level Status sign.

H The SCS shall be designed and manufactured to accommodate all spaces within the garages and other facilities regardless of how those spaces are assigned. The central controller shall have sufficient input-output ports and interfaces to receive the inputs, communicate with all vehicle detection device, status signs, and other devices for all garage levels and facilities. The SCS shall operate in real-time with the PARCS. The entry and exit signal shall be received within one (1) second from the event and appropriate displays activated.

15.2 Software Requirements

A The SCS shall provide real-time counting, control, and display (workstation and signage).

B The SCS shall be fully automated with no operator intervention required under normal operating circumstances.

C The Airports Authority shall determine the initial number of vehicles that a parking level or facility shall accommodate. It shall be possible for the Airports Authority to adjust the total parking spaces for each level or facility.

D The SCS shall store occupancy counts for each parking facility, each area, and each level.

E The stored counts shall provide activity levels for selectable time increments (minutes, hour, day).

F The SCS shall maintain counts for each entry and exit lane and record the number of transient, credential, reservation and total counts for each parking facility, lane and area.

G The SCS shall correctly add/subtract in cases of illegal entry or exits for each lane.

H The SCS shall provide hourly flow rates through entries and exits.

I The SCS shall allow occupancy thresholds to be set and shall automatically mark parking facilities/areas as 'Full' on space available signs. Customers shall be allowed to enter a parking facility/area when in ‘Full’ status. The SCS shall provide a release threshold to put signs back to displaying available spaces.

J The SCS shall allow for PARCS spaces available and occupied to be manually changed by the PARCS Administrator.

K The SCS shall record changes made to the spaces available or occupied.

L It shall be possible to access management reports without interrupting real-time operations of the SCS.

15.3 SCS Workstations

A All data required to monitor, control, and adjust the SCS shall be available in real-time on a designated PARCS workstation and preferably accessed via a browser. The screen format shall be designed for the ultimate parking configuration (layout). All screen formats for the SCS shall reflect the physical layout of Airports Authority parking facilities for ease of associating the displayed data with physical locations. Any change in the proposed screen format shall be subject to the Airports Authority’s approval.

B The SCS shall provide user access levels with password restrictions.

C The SCS workstation shall display the number of spaces occupied and available by parking facility by user type (transient, credential, and reservations) and segmented areas such as reserved parking, premium parking and valet parking which shall be separate fields on the workstation display.

D The SCS workstation shall display capacity, occupied spaces, available spaces, and percentage full for all parking facilities at each level.

E Alarms on the PARCS workstations to notify when a facility is “Full”.

F In the event vehicles continue to enter a parking level after the “Full” sign is activated, a warning indication on the workstation’s display shall be activated. This indication shall cause the SCS to record negative spaces occupied. As vehicles exit a parking level or facility, the negative spaces occupied shall decrease until the spaces occupied is less than the designated full number. The workstation’s display shall be updated in real-time.

G The Airports Authority shall have the ability to manually “close” a garage level by overriding the displayed number of parking spaces available.

H The Airports Authority shall have the capability to override the status displayed and to change the predetermined occupancy number that triggers a change from one sign display to another.

15.4 Signage Integration

A The SCS shall interface in real-time with the current space available signs located at Airports Authority facilities. The signs display the number of spaces available or “Full” for each level of the parking garage.

B The SCS shall integrate in real-time the space available signs located on each level throughout Airports Authority Garage facilities.

15.5 Interfaces

A The SCS shall interface with the Airports Authority’s website to provide facility counts in real time.

B The SCS shall interface with the Airports Authority’s mobile application to provide facility counts in real time.

C The SCS shall provide remote access to SCS data in real-time.

16 CUSTOMER LOYALTY PROGRAM

A The PARCS shall interface/integrate with a customer loyalty program (CLP) that provides special rates, access to preferred parking areas, and issue/redeem loyalty points.

B The CLP shall interface with an online customer website to enroll in CLP, view activity, and redeem points.

C The system shall interface with the following credentials: license plate, a bankcard, QR code on a smart phone, or a PARCS credential such as a proximity card or AVI transponder.

D The PARCS system shall be able to identify qualifying parking transactions as part of a loyalty program or promotion.

E Different point values can be assigned based on the parking facility, parking area, time of day, day of week, and customer loyalty status.

F When a parking transaction qualifies for loyalty points, the customer can enter their loyalty card number during the reservation process so that the points can be issued.

G The hosted system shall send the transaction information to the Airports Authority to credit the customers' account for the points earned.

H If a transaction is cancelled later and refunded, the loyalty points shall be taken back from the customer."

I The CLP shall be able to interface with other 3rd party loyalty programs or redemption vendors.

17 PARCS REPORTS

This section provides requirements on report tools, data filters/queries/exports and standard reports.

17.1 PARCS Reports Features and Requirements

A Contractor shall make available to the Airports Authority all reports that have been developed for the proposed PARCS. Contract shall submit a list of all available reports at the PDR to be approved at the FDR. CDRL 137

B Contractor shall submit with the proposal a sample of each core report defined in section 17.G and available LPR statistical reports.

C Standard reports shall be generated for selectable times.

D All reports shall include subtotals and sum totals of activity listed on the report.

E User-selected timeframe parameters for generating reports shall be, at a minimum:

1. Start/end time (mm/dd/yyyy hh:mm:ss)
2. Daily
3. Weekly
4. Monthly
5. Yearly

F Reports shall be available by data field as defined in Sections 5.1.K and 5.6.G.

G Each report shall be available on-screen and hard copy in identical format. Reports shall be formatted for printing on standard 8.5" x 11" paper.

H All printed reports shall include the date and time the report was generated.

I Fully functional “print screen” capability shall be provided for all reports.

J PARCS report output options shall, at a minimum, include:

1. Screen/Monitor.
2. Printer.
3. Converted to a file for export to the most current version of MS Access, Excel, .csv, .pdf formats.

K Shall provide a Report Generator tool with the following capabilities:

1. Generate and save ad-hoc reports based on user-specified output format and utilizing any data elements maintained in the database.
2. A report scheduler.
3. Print or email all cashier shift reports each day without having to individually print each shift report.

L All reports shall be tested for data accuracy by the Airports Authority and the Contractor during the FAT and during lane acceptance testing.

M The Contractor shall provide ten (10) custom reports, in addition to the reports defined herein, with content and layout defined by the Airports Authority.

N The custom report content shall consist of data that resides in the PARCS database.

O The PARCS shall provide the capability to report on all exception transaction data for a selectable time by transaction type, device ID, or user ID.

17.2 Revenue Reports

A Provide reports that summarize revenue from by facility, device, product type (includes registered parker programs) and payment types for a selectable time period.

B Provide reports that summarize discounts by facility, device, product type (includes registered parker programs), cashier ID, lane, and payment types for a selectable time period.

C Provide reports that provides details of each transaction by facility, device, product type (includes registered parker programs), cashier ID, and payment types for a selectable time period.

D Provide reports that summarizes revenue by entry media type facility, device, product type (includes registered parker programs) and payment types for a selectable time period.

E Revenue Source Reports

1. Provide a revenue summary report that includes revenue from all sources to be shown in one report for a selectable time period. The report shall identify each type of revenue source:
   a Self-park
   b Valet

c PARCS credentials for pay-per-use or prepaid credentials tied to a bankcard and auto-charged when exiting the parking facility (Note: does not include employee permit revenue)

d PARCS credentials for employee parking

e Sales channel revenue

f Online prebooking

g Other 3rd party providers

h Other products and services such as vehicles services, luggage services, lounge passes, discounts purchased by merchants, etc.

2. Provide a detail revenue report for each revenue source for a selected time period. The detail report includes each transaction (with transaction details as defined in the reports section) for the selected revenue source. The report can be generated for all parking facilities or a single parking facility.

F The core reports include the following reports (CDRL 114) that are critical to shift and daily revenue reconciliation and auditing. For this reason, the report content and format are critical to the Airports Authority and if the standard reports are not satisfactory to the Airports Authority, newly designed report shall be required and shall not be considered as one (1) of the ten (10) custom reports.

1. Revenue Summary Report

a This report is used to reconcile daily cash, bankcard, and 3rd party revenue to deposits.

b The report provides a line displaying the shift totals for each shift processed during a day for all point of sale devices and 3rd party revenue sources. The report provides subtotals by facility and a grand total of all facilities.

c For parking facilities/areas with shared exits, the Revenue Summary Report shall report each facility/area as a separate facility.

d The report shall include the number and revenue amounts for regular transactions, exception transactions, prepaids, discounts and net revenue.

2. Bankcard Reports

a Provide revenue by bankcard reports that allow the Airports Authority to daily reconcile revenue by each source to revenue by bankcard type (i.e. American Express, Discover, MasterCard, Visa) and research transaction details when the daily deposits don’t balance.

b Offline Transaction Uploaded Report – Provides each transaction occurring in offline mode and status (approved/declined) of upload once the PARCS is back online.

3. In-Lane Cashier Shift Audit Report that includes:

a Summary of cashier shift activity

b Transaction detail (as defined in the Detailed Transaction Report) listed for each of the following transactions:

i Exception transactions

ii Validations and Discounts

iii Information entered into the Cashier Station input fields

c Report of data input fields by cashier ID, transaction type, or discount type.

4. Remote Cashier Audit Report

a Report that allow audits of each remote cashier shift.

b Provides transaction details.

c Data input manually by the remote cashier such as the entry date, /time, ticket sequence number, license plate number, and discount value are recorded to allow the transaction to be audited.

d Provide the event detail for each gate vend performed by the remote cashier

i Date

ii Time

iii Lane

iv Reason for gate vend

5. Cashier Performance Analysis Report

a Provides trend analysis of cashier activity for each month. Specific report format is essential for the usefulness of this report. The required report layout is provided in the Appendix C.

b Report content includes the %'s and number of transactions for the following data:

i Cashier.

ii Total tickets.

iii Revenue per ticket.

iv Cash revenue per ticket.

v Total number of exception transactions.

vi Percentage of exception transactions.

vii Lost tickets.

viii Unreadable paper tickets.

ix Unreadable virtual tickets.

x Unreadable POF prepaid tickets.

xi Validations.

xii Handicap.

xiii Cancel.

xiv Grace period.

c During the design phase, the Airports Authority may choose to eliminate some of the columns listed in item C in the final report layout.

6. Discount/Validation Report by Cashier

a Provides trend analysis of cashier validation activity.

b Specific report format is essential for the usefulness of this report. The required report layout is provided in the Appendix C.

c The report shall display the validations programmed in the PARCS. Due to the number of validations, the report shall allow the Airports Authority to select which validations to include when generating the report.

d The report shall be able to be generated for a selectable time but shall default to a monthly report.

7. Detail Transaction Report
   a Provides a chronological listing of each exit transaction for a device/cashier and includes all information related to the transactions including, at a minimum, the following information for each transaction:
      i Cashier/shift information (ID, shift number, start/end date).
      ii Entry lane ID.
      iii Entry date/time.
      iv Exit lane ID.
      v Exit date/time.
      vi Entry media sequence number
      vii Gross revenue.
      viii Collected revenue.
      ix Payment method.
      x ISF.
      xi Prepaid amounts (POF, Reservation, QR etc.)
      xii Validation type (ADA, Parking Ops, etc.).
      xiii Validation dollar amount.
      xiv License plate number.
      xv Notes field for input data.
   b The sum totals of the Detail Transaction Report shall equal the totals on each Shift Report.
8. Exception Transaction Report
   a Provides a list of exception transactions for a selectable time period by transaction type, facility, cashier/user ID, or device ID.
9. POF Revenue Summary Report
   a Provides a summary of transactions paid at POF Stations for a selectable time.
   b The report shall display the total number of transaction and dollar amount by POF Station by parking facility with a subtotal of all facilities for each POF Station and a grand total of all POF Stations.
10. Discount Summary Report – Provides a summary of the number and dollar value of validations processed by account type.
11. Detail Discount Report – Provides a chronological listing of each validation transaction processed by account to be used for invoicing support documentation.

G ISF Report – Provides a list of outstanding ISF transactions sortable by transaction date, customer, cashier, or dollar amount. This report includes the transaction number, dollar amount of gross parking fees, amount paid, and ISF dollar amount; subtotals by customer; and grand totals.

H ISF Aging Report

1. Provides a list of outstanding ISF transactions with a primary sort being the date and a secondary sort selectable by customer name, address, driver’s license number, or any other report field.

2. Includes columns to show outstanding payments past due thirty (30) days, sixty (60) days, ninety (90) days, and over one hundred and twenty (120) days.

I ISF Paid Report – Shows a list of ISF transactions that have been paid within a selectable time in the same format and returning similar data to the ISF Report.

J Rate/Product Category Report – Provides a summary of the activity by rate category for a selectable time and by day of the week (Sunday – Saturday) by facility.

K Ticket Stratification Report – Lists the number of tickets processed, by fee, for a selectable time and facility(s).

17.3 **Operating Reports**

A Attendant Report – lists open shifts and closed shifts for a selected time.

B Ticket Status Report – Provides ticket/entry media status (open/closed) and information: entry date/time, entry lane ID, entry media id A closed ticket is defined as a ticket processed at the exit.

C Outstanding Ticket Report – Provides a list of tickets that have been issued but are not yet processed at an exit for a selectable time.

D Stolen Ticket Report – Provides the total number of stolen tickets dispensed by entry lane for a selected time.

E Average, peak, and overnight stay occupancy reports by area and facility.

F Duration reports

G Entry Lane Reports

1. Provides the number of entries by entry media type for each lane with a facility total.
2. Provides entries by lane for each entry media type by day with a monthly total. Available for a parking facility or all facilities in total.

H Exit Lane Reports

1. Provides the number of exits by entry media type for each exit lane with a facility total.
2. Provides exits by lane for each exit media type by day with a monthly total. Available for a paring facility or all facilities in total.

I POF Lag Time Report – Provides a list by parking facility of the number of POF transactions exiting within each minute up to sixty (60) minutes for a selected period.

17.4 **Discount Reports**

A Summary report for discounts generated that includes the following information:

1. Discount Production Unit ID (all or one station)
2. User ID
3. Date
4. Number and dollar amount of discounts issued for each account. Provide For each account subtotals for type of discounts issued (original paper ticket or chaser ticket). Provide grand total of subtotals.

5. Report can be generated by any of the data fields included in the report.

B Detail report for discounts generated that includes the following information:

1. Discount Production Unit ID (all or one station)
2. User ID
3. Date
4. Account number
5. Validation type (original ticket or chaser ticket)
6. Dollar value
7. Total for dollar value column
8. Report can be generated by any of the data fields included in the report

17.5 Valet Reports

A Central Cashier Station - Same reports as exit Cashier Station without the gate activity.

B Vehicle Inventory

C Key Board Inventory

D Checkout Ticket Report

E Closed Ticket Report

F Delivery report - includes dispatcher, gate number and keyout time.

17.6 Pre-Booking Reservation Reports

A The PRS shall have a full reporting package to track customer usage, yield management statistics, sales channel management, revenue reporting, and clearinghouse reconciliation reports.

B Reports shall have selectable start and end date/time and selectable facilities/products.

C The PRS shall provide detailed reports of transactions completed for revenue reconciliation purposes and prepaid reservations revenue to determine unearned revenue each month.

D The Contractor shall provide copies of relevant PARCS reports displaying PRS data for review and approval by the Airports Authority as part of the PDR package.

E The Contractor shall ensure that all relevant PARCS reports display reservation related data including revenue earned as prepaid reservation revenue on the Shift Report, Detailed Transaction Report, and Revenue Summary Report.

F The PARCS shall provide detailed reports of transactions completed for revenue reconciliation purposes and prepaid reservations revenue to determine unearned revenue each month.

17.7 ACMS Reports

A Revenue summary report for selectable periods by:

1. Product, entry media type, parking facility, parking area, and payment method
    a Permits paid by Employee
        i Online payments
        ii Automated bankcard charges
        iii Automated ACH charges
    b Permits paid by Employer
    c Customer pay per use
2. Credential type
3. Credential number
4. Account ID
5. Rate

B Credential Status Report

1. Provide a report of credential number, account, cardholder name, credential status (active/inactive), passback status setting (hard/soft/neutral), rate (including free credentials), and total number of cards.
2. Report shall be sortable by report data fields.

C Credential Account Data Report

1. Provide a list of credential holders that include credential number, account, cardholder name, address, activation/de-activation date and rate.
2. Report shall be sortable by credential number, account, activation/de-activation date, or rate.

D Credential Activity Usage Reports

1. Provide a chronological list of credential usage and includes date, time, card number, and entry/exit land ID
2. Data shall be capable of being sorted by date, time, card number, and entry/exit lane.

E Passback Violation Report

1. Provide a list of passback violations for a selectable time for an account, individual credential number or lane.
2. The report shall include the entry/exit lane ID, date/time, number, and passback setting (i.e. hard, soft).

F Credential Revenue Report

1. Provide a list of active credentials that includes the amount due (for a selectable time period such as monthly, quarterly, or annually), account number/name, credential numbers/names associated with the account, and payment form (invoice, bankcard on file, etc.).
2. The credential Revenue report shall include the payment form (invoice, bank card on file, etc.). The report shall be sortable by all report fields.

G Credential Transaction Detail Report

1. Provide a chronological listing of each credential transaction processed.

2. The report shall include the credential number, account number, entry/exit date/time, entry/exit lane ID, total fee, discounts, total paid, payment method, and license plate number. The report shall include sum totals for each column.
3. The report shall be sortable by all report fields.

H Credential Payments Received Report

1. Provide a list of payments received (for a selectable time period such as monthly, quarterly, or annually) that includes the account number/name, credential numbers/names associated with the account, billing form (invoice, bankcard on file, etc.), amount paid, payment method (cash, bankcard, check), and date paid.
2. The report shall be sortable by all report fields.

I Credential Accounts Receivable Aging Report

1. Provide a list of accounts/credentials with outstanding balances, showing balances for 30 days, 60 days, and over 90 days past due.
2. Report shall include the account number, credential number, name, rate, and amount past due in the appropriate column. The report shall include sum totals for each column.
3. The report shall be sortable by all fields.

17.8 LPR Statistical Data

A The LPR subsystem shall provide statistical information available for selected time, by lane and facility. The data shall provide a sum total for all entry lanes and all exit lanes for each parking facility.

B LPR Capture – The LPR subsystem shall automatically extract the number of No Plate on Entry and No Plate on Exit transactions. The LPR subsystem shall provide the No Plate total for entries and exits and also provide a detailed list of each No Plate transaction for entries and exits.

C LP Accuracy – The LPR subsystem shall provide a method for the Airports Authority to review and score the accuracy of each plate capture. The scoring tool shall automatically compute the number of transactions with one character error, two character errors, three character errors etc. up to eight (8) character errors. The scoring tool shall compute the number of transactions that were unreadable due to no plate on the vehicle, stacked characters, or obstructed LP.

D LPR Entries and Exits – The LPR subsystem shall provide the total number of all entry and exit transactions processed by the LPR subsystem.

E Automated Exit Reviews – The LPR subsystem shall provide the number of exits that were automatically processed by the LPR subsystem (not sent for manual review).

F Manual Entry and Exit Reviews – The LPR subsystem shall provide the number of entry and exit transactions that were sent to the IRW for review, the total number of PARCS entries and exits, and the percentage of entry and exit reviews compared to total entries and exits.

G Swapped Media – The LPR subsystem shall provide the total number of swapped media transactions and provide a detailed list of each Swapped Media transaction. The detail list shall include the sum total for the selected time period as well as the following:

1. Fee computed based on the Swapped Media.
2. Actual correct fee charged based on the exit LP image.
3. Difference between the swapped fee and the actual fee.

H IRW Timeouts - The LPR subsystem shall provide the total number of IRW Timeout transactions and a detail list of Timeout transactions. The list shall be available by parking facility, by date/time, and/or by IRW user ID.

I No Plate on Entry - The LPR subsystem shall provide the total number of plates not captured at entry.

J No Plate on Exit - The LPR subsystem shall provide the total number of plates not captured at exit.

K Exit No Matches - The LPR subsystem shall provide the total number of plates not matched at exit (not entry record found for the exiting plate).

L LPR to PARCS Transaction Analysis – compares the number of transactions processed at entry and exit in the PARCS database to the number of transactions processed in the LPR database.

17.9 **MLPI System Reports**

A Reports shall reflect current data uploaded from collection units.

B Reports shall be capable of being run on demand or scheduled to run periodically.

C The MLPI reports shall be capable of being printed at workstations.

D Inventory Report

1. All license plates parked at Dulles Airport by zone, level, type or parking facility.
2. Listing shall be alphanumeric by state and license plate number and shall list the license plate, state, space location, entry date, and number of days inventoried in the same space.

E Aged Vehicle Report - Vehicles parked greater than configurable number of days.

F Vehicles by State Report - Vehicles parked sorted by state.

G Vehicles by Zone Report - All license plates parked within each sub zone (i.e., each floor) for each parking facility. Listing shall be alphanumeric by state and license plate number.

H Inventory Value Report - Each parked vehicle’s license plate number, state of registration, area of parking facility, row number, and date of first appearance on LPD, minimum fee due.

I Disappeared Vehicle Report – Shows vehicles that were dropped from the inventory but are not recorded as exiting. Disappeared vehicle license plates listed alphanumeric by state and license plate number, and including entry date.

J Reappeared Vehicle Report – Provides a list of vehicles that has been inadvertently skipped during inventory process. For example, a vehicle that is recorded for night #1, disappears for night #2, and then reappears in same parking space for night #3 is assumed to be parked for all three nights.

17.10 Event Logs

A The ability to filter and print events by type for a selectable time and selected facilities and/or devices. It shall include the date/time of event occurrence, date/time of log time (when the event was recorded in the PARCS), print communication messages, facility lane equipment alarms, manual and remote gate opening, PARCS configuration changes, system log on/offs, entry activity, exit activity and all other PARCS events.

B The event log shall include the ability to create a listing of changes to the PARCS and users who made changes.

18 PARCS EQUIPMENT

This section identifies equipment technical requirements for each piece of PARCS equipment. The installation location of the equipment is located in the Equipment Matrix in the Appendix.

18.1 General Requirements

A The location and type of PARCS devices is shown in the PARCS Base Bid Equipment Matrix in Appendix A.

B POF Stations shall be installed at locations as specified by the Airports Authority.

C Should any discrepancies or inconsistencies exist between the PARCS Base Bid Equipment Matrix and the summary of equipment to be provided below, the PARCS Base Bid Equipment Matrix takes precedence over the following summary. The Contractor shall supply the following:

1. Entry Stations with pinhole cameras.
2. Pay-on-foot Station with pinhole cameras.
3. Exit Stations with pinhole cameras.
4. Cashier Stations with exterior booth-mounted Transaction Panels.
5. LPR Lane Equipment.
6. LPR Image Review Workstations.
7. Barrier Gates.
8. Intercoms.
9. 1D/ QR Barcode Readers.
10. EMV Chip Bankcard Readers.
11. Near Field Communication (NFC)/Contactless Bankcard Readers
12. Proximity Card Readers.
13. AVI Readers.
14. Central Cashier Stations.
15. Uninterrupted Power Supply (UPS) Units.
16. Valet Handheld Units.
17. 360° Lane Valet Cameras.
18. Mobile License Plate Inventory Handheld Units.
19. MLPI Vehicle Units
20. PARCS Bankcard Refund Unit.
21. Validation /Discount production unit.
22. Clamshell Validators.
23. Entry Lane VMS Rate Signs.
24. Lane VMS signs.
25. Vehicle Detection.
26. 4” Galvanized bollards with sleeve covers as needed at entry and exit to protect the lane equipment.
27. Test Bed Equipment
28. Spare Parts

B All devices, component enclosures shall comply with Environmental Conditions/Site Conditions at Dulles Airport. See Section 4- Scope of

Work. Vehicle detection systems shall accurately perform in all weather conditions.

D The Entry Stations, POF Stations, Exit Stations, Cashier Stations, Booth Transaction Panels, and Barrier Gates shall have the following:

1. Equipped with barrel-type locking mechanism with the capability of being re-keyed. Excludes the Booth Transaction Panel.
2. Access door with appropriate tamper-resistant locking system with secured switch for activating/deactivating all lane equipment (each entry station keyed alike, and unique to Authority's installation). Excludes the Booth Transaction Panel.
3. All components required for each device shall be located inside the device housing unit.
4. All components and wires/cables shall be neatly installed and organized within each device.
5. Shall have a manual on/off switch located inside of the lockable housing.
6. Shall contain a 115 VAC, grounded convenience outlet with one (1) three-prong standard receptacle electrical outlet located inside of the device. Excludes the Booth Transaction Panel.
7. Equipped with readers as defined in Section 18.4 Excludes Barrier Gate.
8. Placement of the readers on the face of each device shall be provided by the Contractor as part of the PDR Package with approval by the Airports Authority at the PDR. Excludes Barrier Gate.
9. Operates automatically, completely unstaffed, twenty-four (24) hours a day. Excludes Cashier Station.
10. Has the following features and functionality:
    - a Read entry media. Excludes Barrier Gate.
    - b Compute and display a parking fee. Excludes Barrier Gate.
    - c Process exception transactions (Cashier Station and Remote Cashiering only).
    - d Accept all payment types as defined in Section 7. Cash/checks accepted only at Cashier Stations. Excludes Barrie Gate.
    - e Accept and applies discounts, validations, and promotions for all entry media presented at exit. Excludes Barrier Gate.
    - f Void all processed entry media ID and validations upon completion of a transaction so that they cannot be re-used Excludes Entry Station and Barrier Gate.
    - g Prints a patron receipt. Excludes Entry Station and Barrier Gate.
        - i Configurable signature requirement (Cashier Station only).
        - ii Configurable option to automatically issue receipts or allow customers to select a receipt.
        - iii The configurable timeout function for receipt request shall be initially set for twenty (20) seconds or until the next ticket is inserted.
        - iv The gate opens when the customer selects 'no receipt' or removes the receipt from the device.

v Capacity to hold a minimum of two thousand (2,000) receipts.

h Configurable receipt with the following minimum information. Receipts for Cashier Booth are printed at the Booth Transaction Panel except for ISF 3-part receipt, which is printed at the Cashier Station:

- i Washington Dulles International Airport.
- ii Airport Address
- iii Receipt #
- iv Entry lane ID.
- v Entry date/time (mm/dd/yyyy; hour/minute/second in military time).
- vi Entry media sequence number.
- vii Exit lane ID
- viii Exit date/time (mm/dd/yyyy; hour/minute/second in military time).
- ix Length of stay
- x Payment device ID.
- xi Product/promotion ID
- xii Rate(s)
- xiii Dollar Total Fee.
- xiv Discount Dollar Amount.
- xv Discount Type (code).
- xvi Dollar Net Paid.
- xvii Payment date/time. Last four (4) digits of the bankcard number.
- xviii Bankcard type.
- xix Authorization code.
- xx Payment/transaction sequence number.
- xxi Lag time grace period message: "Exit before [computed exit time] or additional fees may apply". For POF Station receipts only.

i Illuminated ticket slot. Excludes Barrier Gate.

j Utilize visual instructions for patrons to understand the sequence of events to complete a transaction. Excludes Barrier Gate.

k Issues audio voice instructions to compliment the visual instructions. Feature can be set on or off. Excludes Barrier Gate.

l Offer multiple languages. Excludes Barrier Gate.

- i Entry/Exit stations and Booth Transaction Panel – 2 languages.
- ii POF Stations - allows the customer to select instructions in one (1) of up to four (4) languages – including U.S. English and Spanish.

m Push-button or (virtual push button) intercom integrated into the face of each device. Excludes Barrier Gate.

n Pinhole camera to activate upon activation of intercom. The camera feeds to the command center where equipment

monitoring and remote cashiering occurs. Excludes Barrier Gate.

o Cancel button. Excludes Barrier Gate.
  i Allows user to cancel a transaction once entry media or validation has been presented.
  ii Upon activation of the cancel button, if a paper ticket transaction is cancelled the device shall return the ticket and the validation (if applicable) to the customer.
  iii The ticket and validation shall be usable when the customer attempts to exit again.
  iv If a virtual entry media is cancelled at entry the device shall return the entry media (if applicable) and no entry shall be recorded.
  v If a virtual entry media is cancelled at exit the devices shall return the entry media (if applicable) and the virtual ticket shall remain in 'Open' status.

p Prints/encodes following payment information on the paper ticket (if used) and replacement ticket (if used at Cashier Station only). Excludes Entry Station and Barrier Gate:
  i Exit date/time ((mm/dd/yyyy; hour/minute/second in military time format).
  ii Exit device ID.
  iii Total Fee.
  iv Validation amount.
  v Validation code (type).
  vi Amount paid.
  vii Payment method (cash, check, bankcard, validation, prepaid reservation, 3rd party app).
  viii Bankcard type (if applicable).
  ix Last four (4) digits of the bankcard number (if applicable).
  x Transaction sequence number.
  xi License plate number. Excludes POF Station).
  xii Abbreviations are acceptable.

q For paper tickets/receipts remaining in the device and not removed, the device shall ingest the paper ticket/receipt once the vehicle backs out of the lane. For POF the paper ticket/receipts is ingested after a configurable time period. Excludes Barrier Gate.

r Provide at a minimum the following the following system alarms that notify system users via a PARCS workstations or email.
  i Low paper stock alarm. Excludes Barrier Gate.
  ii Empty paper stock alarm. Excludes Barrier Gate.
  iii Device is offline.
  iv Device door is open.
  v Gate stuck up. Barrier Gate only.
  vi Backout alarm. Excludes POF Station and Barrier Gate.
  vii Stolen ticket alarm. Entry Station only.
  viii Device jam. Excludes Barrier Gate.

ix License plate on Hot List. Excludes POF Station and Barrier Gate.

x Remote cashier function required.

xi LPR review required.

s Require protective bollards for all devices located near vehicle driving areas. Computerized Lane Control and Interface Processor (LCIP) to control equipment component communications within the lane and to the Servers utilizing TCP/IP.

t Transmit all transaction data in real-time to the PARCS CDMS and have the capacity to process transactions in stand-alone capability.

18.2 **System Counts**

A The PARCS shall provide three (3) types of counts used for various operational purposes:

1. Non-resettable mechanical counters.
2. Vehicle Detection / Loop-based counts for Entry /Exit Lanes in the Space Count System.
3. Transaction counts.

B Non-resettable mechanical counters shall be mounted on each device (Entry Station, Exit Station, Cashier Station, and Barrier Gate) that increments by a count of one (1) each time a vehicle crosses over all of the lane loops and each time a Barrier Gate is vended (triggered by a transaction or a local gate vend done locally or remotely from a workstation). The mechanical counters shall be labeled and able to be viewed without having to open the device.

C Vehicle detection counts (or loop-based counts if used) for the SCS – increments and decrements by a count of one (1) in the PARCS when vehicle detection (or loops) are activated including directional logic for reverse (i.e. illegal) parking facility entry and exit lanes. Vehicle detection (or loop) counts continue to operate when the PARCS is offline or when a gate remains up due to malfunction.

D Transaction counts – each time an event occurs at a device the PARCS software shall increment a count of one (1).

1. For an Entry Station this is the total entries completed and subtotals by entry media type. At a minimum, entry transaction counts shall appear in lane activity reports.
2. For a POF Station this is the total payments processed and subtotals by entry media type. At a minimum, POF Station payment counts shall appear in POF daily revenue reports.
3. For an Exit Station and Cashier Station this is the total transactions processed and subtotals by entry media type. At a minimum, exit transaction counts shall appear in lane activity reports and shift reports.

18.3 **Vehicle Detection**

A The Contractor is responsible for installing vehicle detection technology that is reliable and meets the requirements of this specification.

B If the Contractor chooses to use inductive in-pavement loop vehicle detection technology:

1. Vehicle detectors shall be self-tuning loop detectors.
2. Vehicle detectors shall have a minimum of three (3) sensitivity modes: high, medium, and low.
3. The loop detectors shall be dual channel detectors. The detectors shall detect the presence or transit of a vehicle over an embedded loop of wire. Vehicle detectors shall indicate when a read occurs.
4. Vehicle detectors shall have a minimum of a two-position frequency switch. No two (2) adjacent vehicle detectors shall be set to the same frequency in order to prevent cross-talk or interference.
5. The loop detector shall provide separate, momentary contact closures upon detection of a vehicle, along with continuous contact closures during the period that the vehicle is detected.
6. The loop detectors shall each incorporate a sensitive Tailgate Recognition System capable of resolving two automobiles within six inches of each other.
7. The loop detector shall be fully microprocessor-based.
8. Vehicle detectors shall be installed using industry standard sizes and distances from each other.
9. Loops
   a Contractor shall install new loops in all lanes.
   b Loops shall be cut-in to the paving surface in saw cuts 0.25 inch wide and 1.5 inches deep filled with sealant approved by the Airports Authority.
   c Loops shall not be spliced.
   d Loop twists shall be per the vehicle detector specification.
   e Three (3) loops shall be used for lanes with Entry Stations, Exit Stations, credential readers and Cashier Stations – two (2) activating loops (loops A & B) requiring simultaneous activations and one (1) closing loop (loop C).

18.4 Entry and Exit Readers

A All readers shall be integrated on the face of the lane device with the exception of AVI readers. AVI readers shall be mounted overhead in each lane unless otherwise noted in the PARCS Base Bid Equipment Matrix located in Appendix A.

B The Airports Authority shall approve the location of any readers that are added on (not a manufactured part of the device). CDRL 138

C The following readers (1-8) shall be installed on the following devices and shall be installed to provide ease of use by the customer:

1. Entry Stations
   a Magnetic stripe
   b Barcode – 1D and Quick Response Codes (QR)
   c Contactless bankcard
   d EMV chip bankcard
   e Near field communication (NFC)
   f Proximity card

2. POF Stations
   a Magnetic stripe
   b Barcode – 1D and Quick Response Codes (QR)
   c Contactless bankcard
   d EMV chip bankcard
   e Near field communication (NFC)
3. Exit Stations
   a Magnetic stripe
   b Barcode – 1D and Quick Response Codes (QR)
   c Contactless bankcard
   d EMV chip bankcard
   e Near field communication (NFC)
   f Proximity card
4. Booth Transaction Panels
   a Magnetic stripe
   b Barcode – 1D and Quick Response Codes (QR)
   c Contactless bankcard
   d EMV chip bankcard
   e Near field communication (NFC)
   f Proximity card
5. Cashier Stations
   a Magnetic stripe
   b Barcode – 1D and Quick Response Codes (QR)
   c Contactless bankcard
   d EMV chip bankcard
   e Near field communication (NFC)
6. Valet Central Cashier Station
   a Magnetic stripe
   b Barcode – 1D and Quick Response Codes (QR)
   c Contactless bankcard
   d EMV chip bankcard
   e Near field communication (NFC)
7. Valet handheld units
   a Magnetic stripe
   b Barcode – 1D and Quick Response Codes (QR)
   c Contactless bankcard
   d EMV chip bankcard
   e Near field communication (NFC)
8. `Roving handheld units
   a Magnetic stripe
   b Barcode – 1D and Quick Response Codes (QR)
   c Contactless bankcard
   d EMV chip bankcard

D Magnetic Stripe Readers

1. The PARCS shall provide a magnetic stripe reader that is capable of reading an International Standards Organization (ISO) standard side-stripe magnetically encoded on:
   a Paper tickets dispensed by the Entry Stations.
   b Discounts encoded on a dispensed ticket created by the PARCS Coding Station.
   c Discounts encoded on a chaser tickets created by the PARCS Coding Station.
   d Bankcards.
2. Accept magnetic stripe parking tickets and bankcard cards through the same single slot.

E 1D Barcode and Quick Response (QR) Code Readers

1. The PARCS shall provide a barcode reader that is capable of reading 1D/QR barcodes:
   a Paper tickets dispensed by the Entry Stations (preferred over magnetic stripe tickets).
   b Discounts printed on a dispensed paper ticket created by the PARCS Discount Production Unit.
   c Discounts encoded on a chaser tickets created by the PARCS Discount Production Unit.
   d Entry media or discount printed by customers on paper.
   e Entry media or discount presented on smart phones.
2. Provide no hazard from the barcode reading laser or other components.
3. Shall be commercially viable and interoperable with PARCS.
4. Interface with the PARCS via USB cable or other standard interface for power and data communications.
5. Have a read range of not less than four (4) inches and not more than ten (10) inches with resolution higher than 1.3 megapixels.
6. Shall read standard 1D barcode and commonly used 2D barcodes.
7. Shall utilize an encryption key, configurable by the Airports Authority, and Advanced Encryption Standard (AES) decryption algorithms to process secure 2D barcodes.
8. Forward validity information to the CDMS for processing and determination of validity using standard data communications protocols.

F EMV Chip Bankcard Readers

1. The PARCS shall provide readers that are capable of reading EMV chip bankcards.
2. Be certified as compliant with relevant portions of the most recent version, in force at time of FDR approval.
3. Comply with EMV Integrated Circuit Card Specifications for Payment Systems Standards
4. Comply with EMV Contactless Specifications for Payment Systems. Readers
5. Be certified compliant as EMV Level 1 and Level 2 terminals;
6. The Contractor shall provide certification documents for the bankcard readers from a qualified, independent third party testing firm

confirming that the reader is compliant with EMV specifications for payment systems requirements. The certification documents shall be submitted for Airports Authority review and approval at not less than ninety (90) days prior to the commencement of installation of the bankcard reader. CDRL 139

7. The Contractor shall be responsible for obtaining timely EMV recertification for all PARCS elements as software changes are made which require recertification prior during support of the PARCS.
8. The Contractor shall verify that all elements of the PARCS have been re-certified as necessary to verify full compliance with the latest version EMV specifications for payment systems prior to the conclusion of the warranty period. This shall occur not less than sixty (60) days prior to the commencement of warranty. Should the required certification documentation not be provided and approved by the Airports Authority at the end of the warranty, the warranty shall extend until such certification and approval be accomplished, prior to responsibility for the PARCS transferring to the Airports Authority. CDRL 140

G Near Field Communication (NFC) /Contactless Bankcard Reader

1. The PARCS shall provide NFC readers that are capable of reading smart phones and contactless bankcards.
2. Shall be installed in all entry and exit lanes.
3. The Contractor shall ensure the NFC readers comply with ISO/IEC standards including 14443 and 18092.
4. Provide no hazard from the NFC reader laser or other components.
5. Shall be a commercially available solution and interoperable with PARCS.
6. Shall have a read range of approximately four (4) inches.

H Proximity Card Readers

1. Provides the following:
    a Consist of antennas, readers and local controllers (as required by Contractor’s system architecture) which read tag number and transmit the data to controller for verification of authorization for access to PARCS and/or recording of appropriate data regarding a transaction.
    b Distributive, networked or centralized processing may be employed, so long as required multi-lane control features are utilized.
    c Cards shall be read when presented within six (6) inches of sensor.
    d A checking protocol that identifies multiple reads of the same card within a few seconds (due to customers “waving” their card in front of the reader) and corrects any false anti-passback reads.
    e Protection from common sources of interference. System shall neither affect nor be affected by neighboring electronic systems or electronically controlled devices. Shall allow universal access to one, multiple, or all facilities depending on parameters that are input.

f Appropriate tools Airports Authority to program and/or encode proximity cards.

I Automated Vehicle Identification

1. The Airports Authority has TransCore Encompass5 (E5) readers and AA3152 antennas as noted in the PARCS Base Bid Equipment Matrix (see Appendix A). The Contractor shall use the existing AVI equipment with the new PARCS, if economically advantageous to the Authority.
2. New AVI readers and antennas shall be installed over the lanes unless noted otherwise in the PARCS Base Bid Equipment Matrix (see Appendix A).
3. The new AVI readers and antennas provided by the Contractor shall read the eGo Plus transponders currently in use by Airports Authority personnel, if economically advantageous to the Authority.
4. The AVI system shall provide continual uploading of data to the CDMS in an online, real-time basis as soon as the system completes the decoding process for the transponder.
5. The reader system shall buffer a minimum of 2,000 transactions per lane and a minimum of sixty (60) days of transactions, if there is a failure of an in-lane controller or communication.
6. Upon restoration of the main server or communications, the reader system shall automatically transmit previously un-transmitted, buffered data to the main server.
7. The AVI system shall be designed according to Federal Communication Commission (FCC) regulatory compliance.
8. The AVI system shall be fully integrated into the parking System in order to provide a seamless access/control system that is fully auditable and provides integrated reports for the parking system as a whole.

18.5 Entry Lane Requirements

A Only one (1) entry media shall be accepted for a single transaction. The remaining entry devices shall be deactivated and no additional entry media shall be read.

B Vehicle Detection and Entry Lane Logic shall function as described below. If a vehicle detection technology other than directional loops is used then it too shall meet the entry lane logic described below.

1. Each lane shall be equipped with vehicle presence and directional loops. As a vehicle drives into an entry lane, it shall pass over the Entry Station’s dual detection loops A and B. When the vehicle is detected by the dual arming loops, the vehicle shall be in position for the customer to either press the ticket issue button on the Entry Station or present an acceptable entry media, bankcard. Only one transaction shall be granted for each vehicle as determined by the closing loop.
2. The detection loops shall have directional logic. Directional logic identifies loop patterns to detect stolen and backout tickets. As a vehicle approaches a lane it activates Loop A and then Loop B. The driver pulls a ticket or presents an entry media and the gate opens. The vehicle drives over Loop C, the gate closes, and the ticket is

recorded as a valid ticket in the PARCS. This event has a loop pattern of A-B-C. If the vehicle backs out of the lane, the loop pattern is A-B-A. When this loop sequence occurs, the PARCS shall void the paper ticket or not record the ticket when other entry media is used at entry. The PARCS shall also void a paper ticket that is dispensed when the vehicle backs out of the lane in an A-B-C-B-A loop pattern. This occurs when the driver takes a paper ticket, pulls the vehicle forward enough to activate Loop C and then backs outs of the lane. The PARCS shall not record an entry media ticket when an A-B-C-B-A loop pattern occurs. The entry media can be presented again at an entry lane.

3. Loops shall have directional logic that detects legal entry, illegal entry, illegal exit, stolen ticket and backout ticket.
   a A legal entry occurs when the entering vehicle is detected by the Entry Station's dual arming loop and the barrier gate's closing loop devices.
   b An illegal entry occurs when entry is made through the exit lane.
   c An illegal exit occurs when a vehicle is attempting to exit a facility by going through an entry lane as detected by the barrier gate's closing loop device being activated first. In such cases, the gate shall not open. The entry lane components shall be unaffected by an illegal exit. This event shall generate an event on an Event Log. The illegal activity shall also cause an audible alarm to sound on the PARCS workstations. The audible alarm shall automatically cease after a predetermined length of time (adjustable by the Airports Authority) or shall deactivate upon manual acknowledgement by an authorized PARCS operator.
   d A stolen ticket occurs when a customer enters the lane, the vehicle is detected, a paper parking ticket is issued, the customer removes the parking ticket from the Entry Station's ticket slot, which signals the barrier gate to open, and the customer backs out of the entry lane. When the vehicle rolls off the B then A loop, a stolen ticket is detected and shall cause the barrier gate arm to lower to the closed position, record the entry transaction as a stolen ticket, invalidate the stolen ticket, and reset the arming loop devices for a subsequent transaction.
   e A backout occurs when a customer enters the lane, the vehicle is detected, a parking ticket is issued, the customer leaves the paper parking ticket in the Entry Station's ticket slot, and the customer "backs out" of the entry lane. When the vehicle rolls off of the B loop a back out is detected and shall retract the ticket into the Entry Station, record the entry transaction as a "backout," invalidate the retracted parking ticket not taken, and reset the arming loop devices for a subsequent transaction.

18.6 **Entry Stations**

A The Entry Station shall provide the following:

1. Integrated readers installed on the Entry Station to process all entry media Excludes AVI readers.
2. Issues paper tickets:

a Push-button (actual or virtual button) activation device that issues one (1) bankcard-sized, ticket for each entry transaction. Bar code paper tickets are preferred.

b Ticket printer designed for easy ticket loading with a minimum four thousand (4,000) ticket capacity.

c Ticket dispensing/printing mechanism(s) that are easily removable.

d Dispensing mechanism shall have self-sharpening ticket-cutters or bursting mechanism.

e If the ticket issue button is first pressed, the Entry Station shall issue a numbered parking ticket and an audible signal shall sound. The audible signal shall stop when the ticket is removed from the Entry Station.

f Prints/ encodes on the ticket the following, at a minimum:

i Entry date/time (hour/minute/second in military time.

ii Facility ID.

iii Device ID.

iv Rate code.

v Entry sequence number.

vi License plate number.

vii Abbreviations are

g The Airports Authority prefers bricks or fan-fold as the ticket format.

3. Each public entry made via a paper ticket dispensed or other entry media is assigned a unique sequential ticket identification number.
4. Each entry shall have a unique ID number that allows the entry media to be traced from entry to exit.
5. Filters and prints all tickets within a selectable sequential identification number range by device.
6. Filters and prints all tickets by status (i.e. open or closed) and type (regular, stolen, or backout) within a user defined date range by device.
7. Filters and prints all open tickets that are older than a user defined date by device.
8. User with access rights can close out old tickets.

a Records the date the ticket was closed and the user ID that closed the ticket.

9. Identifies the ticket as being manually closed out.
10. Provides at a minimum following system alarms that are registered at the central Command Center and are traceable to the specific device.

a Low ticket stock alarm.

b Empty ticket alarm.

c Gate up alarm.

d Backout alarm.

e Stolen ticket alarm.

f Offline, communication disruption

B The Contractor shall describe all possible ways to create a ticket in the PARCS in order for the Airports Authority to understand the risks of fraudulent ticket creation. CDRL 141

18.7 **Pay On Foot Station (POF)**

A POF Station operating description:

1. The customer presents an entry media at the POF Station. If the entry media is recognized as valid the fee shall be displayed to customer.
2. The customer shall present a bankcard and/or a validation (chaser ticket, QR code) for payment. The completion of the payment of a transaction shall cause the entry media to be recorded in the PARCS database (paper tickets are encoded and printed with the payment information). The bankcard and paper ticket (if used) is returned to the customer and a receipt is printed. A buzzer sounds and a visual reminder is displayed until the ticket/bankcard/receipt is removed.
3. If the POF Station cannot read the entry media or it is otherwise identified as an exception transaction, the POF shall return the entry media and display an electronic message that the transaction cannot be processed at this POF Station and the customer should proceed to the cashier. The message shall be programmable from the PARCS Workstation.
4. If the bankcard is not accepted for payment, the customer shall be notified by an electronic message to pay using a different bankcard or press the Cancel button and proceed to a cashier. Upon selecting the Cancel button, the ticket and validation (if used) are returned to the customer and remain valid to use at exit.
5. Once reaching the exit lane, the customer shall insert the paid ticket into the Exit Station or Booth Transaction Panel. If the customer exits within the lag time grace period, the gate shall vend and the ticket shall be ingested into the exit device. If the lag time grace period has expired, the fee due shall be displayed and the customer shall pay before the gate vends.

B The POF Station shall provide the following:

1. Integrated readers installed on the POF Station to process all entry media and payment forms defined in Sections 7 of this document. Excludes AVI readers.
2. Lag time
   a Print/encode a programmable lag time grace period to allow the customer to exit the parking facility without incurring additional fees.
   b For customers exiting after the lag time grace period, the Exit Station, Cashier Station, and Booth Transaction Panel shall compute the additional parking fee due at exit.

18.8 **Exit Lane Requirements**

A Only one (1) entry media shall be accepted for a single transaction at exit. The remaining exit devices shall be deactivated and no additional entry media shall be read.

B Vehicle Detection and Exit Lane Logic shall function as described below. If a vehicle detection technology other than directional loops is used then it too shall meet the exit lane logic described below.

1. Transactions cannot be processed without a vehicle presence on the exit lane arming loop(s).
2. Each lane shall be equipped with vehicle presence and directional loops. As a vehicle drives onto an exit lane, the vehicle's presence on the arming loop(s) shall dispatch a signal to "arm" the exit lane devices.
3. After the exit transaction is complete, the barrier gate shall raise. The vehicle driving over the closing loop C shall:
   a Lower the barrier gate arm to the closed position.
   b Reset the exit lane devices for the next transaction.
   c Send the transaction data to the CDMS for audit and subsequent inclusion in the reporting process.
   d Cause the counters to increment/decrement as described in the System Counts section.

18.9 Exit Station

A Exit Station Operating Description:

1. Once the customer's vehicle is on the arming loop, the Exit Station shall display a message on a display that is built into the Exit Station instructing the customer to insert a ticket or present entry media. The Exit Station reader shall process the entry information and display the parking fee on the display screen.
2. The customer shall be instructed to insert, tap, or waive payment media and validation for payment.
3. The Exit Station shall process the bankcard payment and/or validation in conjunction with all entry media types. After the bankcard is authorized through the clearinghouse, the bankcard is returned to the customer and the receipt is printed.
4. Once the receipt is removed from the Exit Station, the barrier gate is raised. The barrier gate closes after the vehicle crosses over the closing loop.

B The Exit Station shall provide the following:

1. Integrated readers installed on the POF Station to process all entry media and payment forms defined in Sections 7 of this document. Excludes AVI readers.

18.10 Cashier Station with Booth Transaction Panel

A Cashier Station with Booth Transaction Panel Operating Description. When the booth is staffed a customer can use the transaction panel to initiate the transactions or have have the cashier initiate the transaction. The customer can make non-cash payments at the transaction panel or have ethe cashier process payment. Therefore both the transaction panel and the cashier station shall have entry media and payment media readers. If a vehicle detection technology other than directional loops is used then it too shall meet the Cashier Station with Booth Transaction Panel lane logic described below.

1. Once the customer's vehicle is on both arming loops, the Cashier Station is activated and the Booth Transaction Panel shall display a message instructing the customer to insert, tap, or wave entry media.
2. If the customer presents the entry media at the Booth Transaction Panel the entry information is processed, the fee is computed and displayed on the Booth Transaction display screen. The fee shall also be displayed on the Cashier Station.
3. If the customer presents the entry media to the cashier the cashier processes the transaction through the Cashier Station and the fee is computed and displayed on the Booth Transaction display screen. The fee shall also be displayed on the Cashier Station.
4. he customer presents a validation (if applicable).
5. The fee display shows the original fee and the recomputed fee after the discount is applied.
6. The customer can choose to pay using the Booth Transaction panel or hand payment to the cashier to be processed through the Cashier Station.
7. Cash and check payments:
   - a Must be processed through the Cashier Station.
   - b The cashier inputs the amount tendered into the Cashier Station.
   - c The Cashier Station computes the change due, which is displayed on the Booth Transaction Panel and the Cashier Station.
   - d The cash drawer shall not open for non-cash/check transactions.
8. All other payments:
   - a The customer presents payment at the Booth Transaction Panel.
   - b The Booth Transaction Panel shall process the bankcard payment and validation (if applicable).
   - c After the bankcard is authorized through the clearinghouse, the bankcard is returned to the customer (if inserted).
9. A receipt is printed by the Booth Transaction Panel after the cashier closes the cash drawer (if used for the transaction) and before the gate opens.
10. Once the customer removes the receipt from the Booth Transaction Panel, the barrier gate is raised.
11. The barrier gate closes after the vehicle crosses over the closing loop.
12. Cashiers shall not be able to open the barrier gate without processing a transaction.

B The Cashier Station shall provide the following:

1. Integrated readers installed inside of the booth as part of the Cashier Station to process all entry media and payment forms defined in Sections 7 of this document. Excludes AVI readers and proximity card readers.
2. Supports manual bank card processing by the cashier.
3. Only one (1) receipt shall be printed for each transaction, except for the following transactions:
   - a Bankcard transactions requiring signature – (2) two receipts.

b. Insufficient Funds (ISF) – a (3) three-part receipt as described in the ISF functionality.
c. Towed vehicle transaction – (1) one receipt is issued for the tow truck and another receipt is issued for the towed vehicle.

4. PC-based computer with exit cashiering functions
5. Touch screen:
   a. Includes a 'qwerty' keyboard.
   b. Easily read in direct sunlight and at night with fluorescent booth lighting.
   c. Either an active matrix display or TFT LCD (Thin-film-transistor liquid-crystal display) monitor.
6. Receipt printer.
7. Two (2) cash drawers.
8. Interfaces with the Booth Transaction Panel to display to the customer and the cashier the fee due, discounts, net due, amount tendered, and change due (if applicable).
9. Returns all exception and validation tickets to the cashier instead of being deposited in a drop box.
10. Secure and tamper-resistant power supply source/plug and communications/data connections for activating/deactivating the Cashier station that is not accessible by the cashiers
11. The cashier shall not be required to use the Booth Transaction Panel to complete any transaction. All cashier processing shall occur inside of the booth.
12. Cancel button that allows a cashier to cancel a transaction before the amount tendered as been accepted. The parking ticket and validation (if applicable) shall be ejected from the Booth Transaction Panel without voiding the parking ticket or validation.
13. Minimum of two hundred (200) cashier attendant access numbers to assure individual accountability of each cashier.
14. Features for shift breaks and relief cashiers using dual cash drawers.
15. Configurable option requiring the cash drawer to be closed before another transaction can be processed.
16. Allow for at least two hundred (200) validation/discount/promo codes/accounts that can be programmed by the Airports Authority.
17. Does not display prior transaction data on the Cashier Station screen.
18. No functionality that allows cashiers to view their shift activity.
19. Enables configuration of keys/buttons to process, at a minimum, specific business rules and exception transactions.
20. Key is labeled with the term used for each exception transition type defined in this specification.
21. Each exception transaction type is assigned a unique article that is reported in the database and can be sorted and filtered by type for reporting and analysis purposes.
22. Ticket Sequence Number - Following successful completion of each exception transaction, the ticket sequence number, whether manually entered or found by the LPRI shall be automatically deleted from the active ticket inventory and marked as a closed ticket. The only case this shall not occur is for lost tickets with no LPRI plate found.

23. Local Gate Vend - The Cashier Station shall not have a gate vend feature. All gate vends shall occur remote via a PARCS workstation or locally at the gate housing.

C Exception transactions processed at the Cashier Station:

1. Lost ticket.
2. Unreadable paper ticket.
3. Unreadable virtual ticket.
4. Unreadable credential
5. Unreadable POF prepaid ticket.
6. Unreadable Pre-booked reservation ticket (bankcard)
7. Stolen ticket.
8. Backout ticket.
9. Swapped ticket.
10. ISF transactions.
11. Towed and impounded vehicles.
12. Canceled transactions (no cancellations after amount tendered has been accepted).
13. Validations (shall be sortable by type).
14. Split payment.
15. Stand-Alone bankcard processor transactions

D Exception Transaction Functionality

1. An exception transaction is defined as any transaction requiring a form of cashier intervention (i.e. not an automated ticket).
2. All exception transactions shall be recorded by each unique type in the PARCS database and reports.
3. Lost Ticket - The cashier shall select the Lost Ticket key that shall invoke an LPI look up. If an entry date is found the parking fee is automatically computed and displayed on the customer fee display without the cashier having to perform additional keystrokes or steps, and the transaction payment is processed as usual. If the license plate is not found in the LPI, a review is sent to the workstation for Remote Cashiering (RC). If a plate match is not found via RC, the PARCS shall search the LPI database for an entry date to compute the fee. The fee shall include one full day rate for the first day. If an LPI entry date is not found the PARCS shall automatically charge a one-day fee.
4. Unreadable Paper Ticket – The Cashier Station shall allow the cashier to input the entry date/time or ticket sequence number into the Cashier Station for unreadable tickets to compute the parking fee. If the entry date/time is not legible on the paper ticket, the cashier shall follow the same procedures as a Lost Ticket. In all cases, the transaction shall be recorded as an Unreadable Paper Ticket.
5. Unreadable Virtual Ticket – the PARCS shall provide a method to look up a virtual ticket entry date/time in a PCI compliant manner for a virtual ticket that is unreadable in the exit lane. The virtual entry media is entered into the Cashier Station or Remote Cashiering. If the virtual entry date is found the fee is automatically displayed at the

exit lane device. Payment is processed as usual. Upon exit the virtual entry media is automatically set to 'Out' status.

6. Unreadable Credential – this is for a PARCS ACMS credential that is unreadable in the exit lane. The credential number is entered into the Cashier Station or Remote Cashiering. If the credential entry is located the fee is automatically displayed at the exit lane device. Payment is processed as usual. Upon exit the credential is automatically set to 'Out' status.
7. Unreadable POF Pre-paid Ticket – when a ticket paid at a POF unit is unreadable at the exit, the PARCS shall provide a method for the cashier to enter the ticket sequence number into the Cashier Station. The PARCS shall locate the POF payment data to complete the transaction and shall compute and display any additional fees due at exit. The transaction shall be recorded as an unreadable POF prepaid ticket in the PARCS database and reports.
8. Stolen Ticket – the Cashier Station shall not accept a stolen ticket and shall allow the cashier to perform an LPR lookup and process the ticket in the same manner as a Lost Ticket. The transaction shall be recorded as a stolen ticket in the PARCS database and reports.
9. Backout Ticket - shall be processed in the same manner as a stolen ticket except that the transaction shall be recorded as a Backout ticket in the PARCS database and reports.
10. Swapped Ticket – if notified of a swapped ticket where the license plate does not match to the entry ticket, the Cashier Station shall not accept the swapped ticket and shall automatically perform an LPR lookup. The ticket shall be processed in the same manner as a Lost Ticket. The transaction shall be recorded as a Swapped ticket in the PARCS database and reports.
11. Insufficient Funds – an ISF occurs when the customer does not have a method to pay the full parking fee. The Cashier Station shall provide a key to allow a partially or non-paid parking transactions. The transaction shall be recorded as an ISF in the PARCS database and reports. ISF functionality is as follows:
    - a The Cashier Station shall process all ISF transactions.
    - b Configurable option to require remote supervisor approval before proceeding. The supervisor workstation shall display the customer name, fee due, and ISF amount on the remote authorization screen.
    - c The cashier shall enter the customer information and the amount the customer paid. The PARCS shall compute the unpaid amount and record it as an exception transaction.
    - d The receipt printer shall generate three (3) receipts as follows:
        - i One regular customer receipt.
        - ii One customer remittance receipt that includes all receipt content defined in Section 17.D.10.h. and also the following data:
            - a) Amount owed.
            - b) Promissory note transaction number.
            - c) Payment instructions.
        - iii One (1) promissory note file receipt that includes:

d) Customer name.
e) Address.
f) Phone number.
g) Driver's license number.
h) License plate number.
i) Entry date and time.
j) Exit date and time.
k) Total parking fee.
l) Amount paid.
m) Method of payment (cash or bankcard with last four (4) digits and last name).
n) Promissory note transaction number.
o) Agreement to payment terms.
p) Customer signature line.

e The operator collects payment, has the customer sign the promissory note file receipt, and gives the other two (2) receipts to the customer.

f The gate shall not vend until the cashier has obtain the customer's signature.

g ISF Payments:

i Provide a method to post ISF payments into the PARCS from a Cashier Station or a workstation.

ii Maintain a database of all paid and unpaid ISF transactions with the ability to generate reports containing ISF paid and unpaid transaction information along with the data input into the Cashier Station.

iii When a customer attempts to exit while having one (1) or more outstanding ISF transactions, an alarm shall be sent to the supervisor workstation.

12. Towed and Impounded Vehicles

a All towed vehicles are processed at a Cashier Station.

b The tow key shall have the ability to process two (2) vehicles: one (1) tow truck and one (1) customer vehicle.

c The PARCS shall provide a tracked and reported method for the operator to process two (2) tickets with only one (1) vehicle present when a tow truck presents both the tow truck's ticket and the towed vehicles' tickets.

d Both tickets shall be automatically processed (no manual entry of date and time is required). The tow feature shall also allow for one or both of the vehicles to be processed as a lost or unreadable ticket.

e An LPR check initiated at the Cashier Station is required for the towed vehicle to compute the parking fee. The cashier shall manually enter the license plate number of the towed vehicle. This information shall be used to search the LPR database for entry time of the license plate number. If the license plate is found the parking fee is automatically displayed at the Cashier Station and Booth Transaction Panel.

- f The cashier shall enter into the electronic Tow form on the Cashier Station the data required by the Airports Authority.
- g The PARCS shall allow a Tow transaction to also be processed as an ISF.
- h Following completion of the Towed Vehicle transaction(s), the tow truck entry and exit data (including images) shall be cleared from the LPR database.
- i The Cashier Station shall allow two (2) transactions to be processed and signature to be obtained from the tow truck driver before the gate vends.
- j The Cashier Station shall provide a tow truck validation for a value specified by the Airports Authority (dollar or time value).
- k The Airports Authority shall have the ability to change the value of the tow fee charge through the RMS.
- l The barrier gate shall remain in the up position until both vehicles cross the closing loop.
- m The mechanical transaction counter shall increment by two (2).
- n The mechanical barrier gate counter shall increment by two (2).

13. Cancelled Transactions - The Cashier Station shall allow a transaction to be cancelled before payment is processed in the PARCS. The PARCS shall record the cancelled transaction data and it shall be displayed as a cancelled transaction on the Detail Transaction Report.
14. Void Transactions - The PARCS shall not allow a completed transaction (i.e. payment processed) to be voided in the PARCS.
15. Validations:
    - a The Cashier Station shall provide validation function keys or codes that are programmable by the Airports Authority.
    - b The Cashier Station shall provide input fields for desired data related to a validation (driver’s license number, plate number, permit number, etc.)
    - c The Booth Transaction Panel shall read a validation encoded on a paper ticket.
    - d The Booth Transaction Panel shall read a validation chaser coupon that can be processed with a paper ticket. Both the ticket and the validation chaser coupon are voided after being processed and cannot be reused.
    - e The Booth Transaction Panel shall read QR code validations (paper and smart phones).
    - f Phased Discount – The Cashier Station shall provide a key that shall discount the parking fee by a pre-defined number of minutes or dollar amount.
16. Split Payment Transactions – All of the Cashier Stations shall have the ability to use two (2) payment methods to process one (1) transaction. The PARCS shall record the amount and payment method for each payment transaction used. A description of how split payments are recorded in the PARCS database and reports shall be provided to the Airports Authority as part of the PDR Package (CDRL 142) at the PDR.
17. Stand-Alone Bankcard Processor Transactions - Cashier Station shall accommodate transactions processed through a stand-alone

bankcard processor (provided by the Airports Authority) when there is no communication between PARCS and the bankcard clearinghouse. The Cashier Station shall have a separate key for Stand-Alone Bankcard transactions for the cashier to select when transactions are processed through the stand-alone bankcard processor.

E Booth Transaction Panel

1. Shall be mounted to the exterior of the Cashier Booth in a position approved by the Airports Authority. The position shall provide ease of use to accommodate all vehicle sizes and heights. CDRL 143
2. In unstaffed mode, the Booth Transaction Panel shall function and meet the same requirements as an Exit Station.

18.11 Handheld Point of Sale Device

A Provide a solution that allows a roving cashier the ability to process a cash or bankcard transaction in an unstaffed lane.

B The handheld shall:

1. Process bankcards with encryption in real-time
2. Process validations as a payment option
3. Issue a receipt to the customer

C The solution shall interface or integrate with the PARCS so that the revenue collected in the lanes:

1. Is recorded in the PARCS.
2. Is reported by cashier ID and shift.
3. Provides the number of transactions and dollar amounts collected for each payment type accepted by the PARCS.
4. Provides a method to reconcile the transactions processed by the handheld to the transactions recorded in PARCS.

18.12 Discount Production Device

A A Discount Production Unit (DPU) shall provide the following:

1. Prints/encodes a validation onto a dispensed paper ticket.
2. Prints/encodes a separate validation chaser coupon onto a blank ticket.
3. Generates a QR code discount that can be printed on a paper ticket, posted to a website, emailed, published, or sent to a smart phone.
4. Provide rates and discounts defined in Section 8.
5. Display on the device a list of discounts available to create.
6. Restrict available discount production options based on user access privileges.
7. Allow the user to select the validation type to encode on the ticket without having to log into another application.
8. Allow the user to select the number of discounts to create.
9. For printed discounts, the DPU allows a stack of blank tickets to be automatically fed into the device to create the discount coupons.

18.13 Clamshell Validators

A The clamshell validator is an offline validator that shall encode a validation onto a single, open status paper ticket that has been dispensed from an Entry Station within the PARCS.

B The clamshell validator allows one (1) type of validation to be applied to a paper ticket.

C The clamshell validator shall provide time, dollar value, or full (no charge) discount. Limit of one (1) validation per ticket.

D The validator shall provide an indication that the ticket validation is successfully performed.

E Exit lane devices shall read the encoded validation and void it after the transaction is complete so that it cannot be re-used.

F The validation amount and account number or clamshell ID number shall be recorded in the PARCS database for reporting purposes.

18.14 Barrier Gate

A Barrier gates shall contain the following:

1. Direct drive mechanism
2. Barrier Gate that shall be weather and impact resistant
3. Electronically controlled rebound feature
4. Non-resettable, mechanical gate action counter mounted in the barrier gate housing
5. Gate arm that will not damage vehicles
6. Single piece gate arm or articulated as required by height limitations
7. The Barrier Gate arm shall be ten (10) feet and employ a breakaway design that can be quickly replaced when broken. Locations needing a longer gate arm shall have articulated arms. The height of the gate shall be approximately thirty-six (36) inches from the lane ground level when in the down position.
8. Gate shall have the power/resistance appropriate to prevent illegal pass-through and physically pushing up the gate arm.
9. The Barrier Gate arm shall be padded and not be constructed of wood, shall have a powder coat paint color approved by the Airports Authority, and have reflective tape,.
10. Provides quick and easy replacement of damaged gate arms.
11. During a power failure, the barrier gate shall remain in a closed position until power is restored.

18.15 VoIP Intercoms

A The Contractor shall evaluate the condition of the existing intercoms and recommend replacements if needed. If economically advantageous to the Authority, the Contractor shall use existing Guardian Telecom HDE-10 copper hosted Voice over Internet Protocol (VoIP) intercoms at all entry and exit lane devices and shall be integrated with the lane device.

B Intercoms provided by the Contractor shall have the following:

1. Push-button activated, ring-down intercom.

2. Include a symbol or "Press for Assistance" sign indicating the location of the intercom call button.
3. Easily accessed by customers from open window of standard passenger vehicle.
4. Provides audible and visual verification that assistance has been requested, and that assistance has been dispatched.
5. Volume control that shall be configurable locally by an approved technician.
6. The parking office shall be equipped with a console that displays the physical location of the intercom button pressed.
7. Once activated the intercom line shall remain open until the parking management staff terminates the call.
8. In the event that the vehicle detection system is triggered for a configurable amount of time with no transaction being initiated, the intercom station in the lane shall automatically call the Parking Administration Building.
9. The intercom terminal shall allow for connectivity over IP-networks and be IP-enabled digital wire technology.
10. Each lane's phone line shall be directed to the Airports Authority's telecommunications closet maintained by the Airports Authority's communications team.
11. The intercom server shall be required to meet the design requirements of nineteen (19) inch server racks.

18.16 Uninterruptible Power Supply

A Each entry and exit lane device and POF Station shall be connected to an Uninterruptible Power Supply (UPS) unit.

B If economically advantageous to the Airports Authority, the Contractor shall use the existing two (2) hour UPS units currently used in the lanes and provide additional two (2) hour UPS units of like kind as needed.

C The PARCS Base Bid Equipment Matrix (see Appendix A) shows the existing UPS devices and where new UPS devices are needed.

D Each UPS unit shall include software and interface card to provide Web/ Simple Network Management Protocol (SNMP) management through a 10Base-T Ethernet port. Management software shall include the following attributes:

1. Shall allow complete configuration of the UPS devices from a remote location.
2. Shall provide periodic UPS self-test.
3. Shall provide full control over UPS transfer settings.
4. Contractor shall provide TCP/IP-enabled UPS units shall to protect components from loss of power, power spikes, and power sags.

18.17 License Plate Recognition Hardware

A Each entry and exit lane, excluding dedicated bus lanes, shall be equipped with License Plate Recognition (LPR).

B The Contractor shall determine how much conduit, power and communication hardware, and/or trigger loops are necessary and hardware

is required to provide an LPR subsystem to all lanes, excluding the dedicated shuttle bus lanes.

C All communications cable associated with the LPR subsystem shall be fiber optic cable.

D The Airports Authority shall provide the fiber optic cabling for the LPR subsystem. The Contractor shall provide the Airports Authority with the necessary information to ensure the proper type, lengths, and size of fiber optic cabling is purchased.

E Additional conduit required to complete installations shall be installed in accordance with applicable local codes and standards. At the PDR, the Contractor shall submit design drawings stamped by an Engineer, licensed to practice in the Commonwealth of Virginia, showing proposed new conduit installations to the Airports Authority for approval CDRL 144. Exposed conduit shall be protected from vehicular damage and shall not represent a trip hazard.

F The cameras utilized for LPR shall use infrared read technology to capture license plates.

G Image capture devices and necessary lighting shall be placed at all entry and exit lanes, excluding the dedicated shuttle bus lanes.

H The location of each device shall be determined by the Contractor subject to approval of the Airports Authority at the PDR and defined in Camera Installation Plan CDRL 145. All cameras and lights shall be installed with sufficient protection to prohibit damage from vehicular traffic, as defined in the Lighting Code Requirements List subject to approval of the Airports Authority at the PDR CDRL 146.

I All cameras shall utilize Internet Protocol (IP) communications and Power over Ethernet (PoE) using standard Ethernet cabling of CAT-5e or greater.

18.18 Mobile License Plate Inventory Hardware (MLPI)

A The Airports Authority requires an overnight Mobile License Plate Inventory (MLPI) system that uses LPR cameras mounted to Airports Authority-provided vehicles to capture license plates parked in the parking facilities. The MLPI data shall be used as a secondary look up for exit exception transactions to assist in the calculation of parking fees and shall provide vehicle locations for customer assistance.

B At a minimum, the Contractor shall provide the following:

1. MLPI cameras, computers and other equipment required for three (3) Airports Authority-provided vehicles to perform the nightly MLPI.
2. The MLPI cameras utilized for MLPI shall use infrared read technology to capture license plates.
3. The MLPI vehicle unit shall alert the driver of LP’s that are not accurately read (below the defined confidence factor). The MLPI unit shall display the actual LP image on the computer, show the LP number captured by the camera, and allow the driver to input the correct LP number into the computer.
4. The MLPI vehicle computer shall alert the driver when no LP is captured. The MLPI unit shall display the actual LP image on the

computer and allow the driver to input the correct LP number into the computer.

5. The MLPI vehicle computer shall upload the collected inventory data to the PARCS server each night and download the most recent information from the server before taking the nightly inventory.
6. MLPI system software database shall reside on the PARCS Servers for vehicle units and handheld units.
7. The MLPI shall allow some portion of inventory to be taken with handheld units if needed. The handheld data shall upload/download to the same database as the MLPI data.
8. The handheld devices shall meet the following requirements:
   - a Units shall be watertight, shock resistant, and capable of continuous, dependable operation within range of weather conditions experienced at project site.
   - b Unaffected by inadvertent dropping on pavement from a height of four (4) feet.
   - c Weigh less than two (2) lbs.
   - d Unit shall operate and contain enough data for eight (8) hours of collection, and contain enough battery charge to upload all data to the CDMS, and have a rechargeable battery that can be recharged within four (4) hours.
   - e Contain inventory application specific software.
   - f Shall be menu driven and user friendly to operate.
   - g Provides backlit keyboard for data input.
   - h The operator can choose to input data via keyboard or touchscreen but the system does not require some data to be input via touch screen and other data to be input via keys.
   - i Capable of storing at least 7,000 license plate numbers of up to eight (8) digits each, state of origin, facility location, row and stall number.
   - j Full alphanumeric keyboard with traditional 10-key numeric format that does not require using a stylus and keys to input a plate number.
   - k Labels on keys shall remain for life of unit.
   - l Minimum of a four (4)-line display (16 characters each) that is highly visible in daylight and darkness.
   - m Communication port on each cradle compatible with workstations linked to the LPD server.
   - n One (1) charging unit for each handheld device.
   - o Each handheld inventory device shall be capable of being used in any of the Airports Authority parking facilities.
   - p Through a user selectable menu, the Inventory Taker shall select the appropriate parking facility for inventory taking.
   - q It shall be possible for the Airports Authority to add, change, or delete from the menu choices parking facilities to be inventoried.
   - r The programmable feature, to add, change, or delete a parking facility, parking level, or area within a parking level, shall be password protected and accessible only by the Airports Authority.

s The parking facility designator codes shall be a minimum of five (5) characters.

t Each handheld unit shall be able to accept all the inputs necessary to inventory a minimum of seven thousand (7,000) parking spaces.

u The handheld shall have a minimum battery life of eight (8) hours and have a rechargeable battery that can be recharged within four (4) hours.

v The handheld inventory device shall be programmable such that the inventory taking process can be recorded by level, row and space. It shall be possible to add to, change, or delete from the user selectable menu options, the number of parking levels or parking areas available within a parking facility.

w The handheld inventory device shall allow the option of mapping inventory routes for automated license plate number entry. Instead of entering each plate into inventory each night, this option displays the prior day plate number for the space and allows the inventory taker to confirm the plate number, input a new plate, or delete a plate if the space is empty.

x LPI units are to be swappable so if one fails another one can be used for a different mapped route.

y Uploads and downloads from the LPI units to the LPI workstation shall occur for all LPI units that are in cradles connected to the workstation.

z The handheld device’s software shall contain data fields to enter the vehicle’s license plate number and the appropriate province or state. The license plate number field shall be an eight (8)-character field. The state field shall be a two (2)-character field defaulted to “VA” for Virginia.

aa Once the inventory taking process is completed, the handheld device is set into a cradle that shall be connected by a data cable to a workstation operating in conjunction with the PARCS. The inventory taker shall upload the current night’s inventory to the PARCS Central Servers via a workstation. Each handheld shall have an uploading cradle so that the upload sequence can be initiated for all handhelds without requiring the operator to perform additional procedures on the LPI workstation or handhelds. The handheld shall be able to receive downloads from the PARCS central server when cradled.

bb Appropriate checks and balances shall be in-place to detect and report possible data entry errors. For example, if a previous night’s license plate number was “AAB 112” and the current night’s license plate number is “AEB 112,” an Exception/Error Report shall prompt the inventory taker to confirm that the entry “AEB 112 is correct.” The exception reporting process shall identify all details related to the location of the parked vehicles and continue until a “clean” inventory is achieved.

18.19 Signage

A The location of each sign is noted in the PARCS Base Bid Equipment Matrix in Appendix A.

B The Contractor shall evaluate and integrate existing Authority signage with the PARCS, where economically advantageous to the Authority.

C The Contractor shall provide entry lane variable message rate signs for entry lanes as shown in Appendix D.

D The Contractor shall provide the following entry and exit lane Variable Message Signs (VMS) for all parking facilities except the Hourly exit lanes:

1. Daktronics VMS Sign AFT-3500 – 16x80-20-RGB-SF.

E The Contractor shall be responsible for the interface to the following signage with the PARCS currently in use at Dulles Airport, where economically advantageous to the Airports Authority:

1. Stacked space available signs at the entry of Garage 1 and Garage 2. The signs display the number of spaces available or ‘Full’.
2. Space available signs of Garage 1 and Garage 2. The signs display the number of spaces available.

18.20 PARCS Test Bed

A Located at the workshop on Level 1 of Garage 2. The test bed shall consist of one (1) entry lane, one (1) exit lane, and a separate test instance of Airports Authority parking data to use for testing before implementing changes and upgrades to the live PARCS. The Contactor shall provide a Test Bed Installation Plan at the PDR for the Airports Authority’s review CDRL .

B The tests bed shall include:

1. One (1) entry lane equipped with an Entry Station, entry media readers as defined in the Entry Lane Requirements, mechanical counter, LPR camera, barrier gate with mechanical counter, loops, vehicle detectors, UPS, and integration with a red/green lane status light reused from the exit plazas.
2. One (1) exit lane equipped with a Cashier Station and Transaction Panel, Exit Station, entry media readers as defined in the Exit Lane Requirements, mechanical counters, LPR camera, barrier gate with mechanical counter, loops, vehicle detectors, UPS and integration with a red/green lane status light reused from the exit plazas.
3. One (1) POF machine.

C The test CDMS environment shall replicate all functions of the Production CDMS. The test CDMS environment may be sized to support only the needs of the PARCS test bed.

D The Contractor shall mount and connect the PARCS equipment, together with any required network interface devices (such as a switch/router) into the test network. The test network shall be independent of the PARCS network.

E The production CDMS shall transmit to the test CDMS configuration files and other data as necessary to maintain synchronization with the production environment. Under no circumstances shall the test CDMS transmit transactional or other data to the production CDMS.

F The test bed shall not require the same redundancy, failover, virtualization or archival requirements as the production CDMS. However, prior to going

live with Production, these features shall be required to be tested and approved prior to any lane installation.

G The test bed and the CDMS shall both be on the same version of software, other than during the testing of a new software version on the test bed.

H System time shall be synchronized between the test bed and the CDMS.

I Bankcard clearing house communications shall occur between the test bed and the CDMS so that bankcard requirements may be tested.

18.21 Spare Parts

A The contractor shall provide the following spare components to be delivered upon completion and sign-off of the PARCS System Acceptance Test

1. One (1) Entry Station.
2. One (1) POF Station.
3. One (1) Exit Station.
4. One (1) Cashier Station.
5. One (1) Transaction Panel.
6. Two (2) Barrier gates.
7. Five (5) Barrier gate arms.
8. Six (6) intercoms.
9. Seven (7) EMV chip readers.
10. Seven (7) 1D/QR barcode readers.
11. NFC/contactless bankcard readers.
12. Five (5) Proximity card readers.
13. One (1) AVI reader.
14. Two (2) LPR cameras.
15. One (1) additional ticket read/write unit for each device listed above. (However if the read/write unit is the same for each device listed, then the Contractor shall provide one (1) read/write unit).
16. Tools needed by the Parking Operator and Airports Authority staff for basic maintenance of the PARCS devices.

B In addition, the Contractor shall propose a list of spare parts (type and quantity) to be maintained on site. The list of all spare parts required to maintain the system under the submitted preventive maintenance program shall be clearly identified and included in the Proposal.

C The Contractor shall submit with the Proposal a price list for the proposed spare components and spare parts inventory that lists the cost of each component and part. The sum total of the spare components and parts price list shall be put on line 17.0 of the Price Schedule form..

D The Contractor shall provide guaranteed component pricing for seven (7) years following Notice to Proceed date. These prices shall be valid prices for the Airports Authority to purchase the components and spare parts through a service agreement between the Airports Authority and the Contractor.

E The proposed spare parts list is subject to the approval of the Airports Authority, and the Airports Authority reserves the right to modify the spare parts inventory throughout the term of the Contract. The Airports Authority

reserves the right to manage the PARCS spare parts inventory as required to maintain the system. CDRL 147

F The spare parts will be owned by the Airports Authority and shall be maintained by the Contractor. Those spare parts shall be available to the Contractor for use during the equipment testing and Warranty periods. The Contractor shall replace used spare parts immediately upon use so that at the end of the Warranty period the spare parts inventory shall be equal to that provided at the onset of the Warranty period.

G All spare parts that are turned over to the Airports Authority at the end of the Warranty period shall have a one (1) year warranty from the date the spare parts were turned over to the Airports Authority.

H All equipment and parts shall be newly manufactured within the past 6 months and never installed in any other operational system other than for factory test purposes.

I When delivered to the Airports Authority, an itemized list of manufacturer's part numbers, model numbers, pricing, supplier's address, supplier's telephone numbers, and any single source components shall be identified by the Contractor.

J The Airports Authority shall provide a storage location of the spare parts, exact location to be identified by the Airports Authority after Contract Award. The Contractor shall have access to the spare parts inventory and shall have the responsibility of ordering replacement components or parts as components or parts are used prior to completion of the Warranty.

K The Contractor shall present to the Airports Authority the inventory system that will be used to track spare parts. CDRL 148

L The Contractor shall make all PARCS components available for ten (10) years after the PARCS system acceptance.

M In the event that the Contractor withdraws from the manufacture, distribution, or support of parking revenue control systems in the United States; or sunsets a hardware component, the Contractor shall provide the Airports Authority with the notice of such occurrence at least one hundred and twenty (120) calendar days in advance of withdrawal. In addition, the Contractor shall provide the Airports Authority with manufacturing specifications for all Contractor-manufactured components of the PARCS, and the Airports Authority shall be provided the opportunity to purchase a suitable amount of spares of all discontinued components.

18.22 Consumables

A The Contractor shall provide the Airports Authority with receipt specifications; parking ticket specifications (front and back sides of a typical parking ticket delineating required formats; magnetic stripe or barcode location; and proposed ticket manufacturer) for the new PARCS within thirty (30) days following Contract Award. The ticket format shall be such that the Airports Authority can input their required information on the ticket and submit the revised ticket to the Contractor for review and revisions as required. An agreed upon ticket format for each facility shall be finalized within sixty (60) days after Contract Award. Ticket stock delivery shall occur prior to or concurrent with the first equipment delivery to the Airports Authority.

B The Airports Authority desires to not be tied down to any one particular ticket supplier. As such, ticket specifications shall be reproducible by multiple ticket manufacturers.

C The Contractor shall provide 100,000paper tickets to the Airports Authority three (3) months prior to the installation of the first production lane. The number of tickets that are supplied shall be based upon the number of parking transactions processed plus 50% allowance for growth in the number of transactions processed.

D The Contractor shall provide the Airports Authority with one thousand (1,000) proximity cards. The Airports Authority shall provide to the Contractor at the FDR the credential graphics and text that is required to be applied to the proximity cards. Proximity card stock delivery shall occur prior to or concurrent with the first equipment delivery to the Airports Authority. Graphics for proximity card will be reviewed and approved by the Airports Authority at the PDR. CDRL 149

E The Contractor shall provide the Airports Authority with one hundred and fifty (150) TransCore eGo Plus transponders that can be read by the TransCore Encompass 5 (E5) AVI readers and AA3152 antennas currently installed at the Dulles Airport, excluding ground transportation AVI readers. The Airports Authority shall provide to the Contractor at the FDR the credential graphics and text that is required to be applied to the AVI transponders. AVI transponder stock delivery shall occur prior to or concurrent with the first equipment delivery to the Airports Authority. Graphics for transponders will be reviewed and approved by the Airports Authority at the PDR. CDRL 150

19 GENERAL, STANDARDS, AND COMPLIANCE

A Provide and maintain a core parking access and revenue control system that is PCI DSS, ADA, and EMV compliant with upgrades to meet future changes. All hardware and software configuration settings, processes (both manual and automated), policies, procedures, reports, network architecture, data storage schemes and other products resulting from this specification shall comply with the PCI Security Standards Council Data Security Standard (PCI-DSS). All System hardware and software shall be certified compliant with the most current version of the PCI DSS standards.

B The Contractor will be responsible for maintaining the system and software so that it is continually in compliance with these standards which includes, but is not limited to, maintenance/service packs, updates, and security patches.

C PARCS shall be compliant with the Airports Authority’s Electrocnic Communications Systems Policy, Information Security Standards, and Patch Management Policy included in Appendix E. Additionally, the MWAA Network Design Manual is provided for guidance. The Airports Authority may choose ,at its own expense, to audit the Contractor for compliance of

the PARCS information technology infrastructures for upgrade, patch, security and standards compliance. A minimum of one week notice will be provided in advance of the audit.. Any identified deficits shall be remedied in 2-weeks or exception granted by Office of Technology.

D Communications on the Airports Authority's current PARCS network, is on a minimum 10/100 Base-TX Ethernet. The Contractor shall have the uPARCS use the existing LAN for communications. At the Authority's discretion, the uPARCS may be placed on a separate Virtual Local Area Network (VLAN) with appropriate communication ties to the existing Authority Administrative LAN. The Authority shall provide Internet Protocol (IP) addressing schemes. The communications infrastructure requirements and services shall be defined by the Contractor and submitted for written approval by the Airports Authority.

E All work shall be done in accordance with the latest issues of FAA Advisory Circulars, Codes and Regulations, as applicable, as well as the most recent version of the Authority Design Manual.

20 PROJECT MANAGEMENTSUPPORT

This section identifies requirements related to task management and installation including project management, quality assurance, design reviews, testing, training, and documentation

20.1 Project Management Support- General

A The Contractor shall ensure that this contract is effectively and efficiently managed to the mutual benefit of the Contractor and the Authority. The Contractor shall employ as necessary the personnel, personnel hours, tools, and systems to manage and deliver the project. The Contractor will allow Authority and Authority representatives to work alongside the Contractor without exception.

B The Contractor shall apply knowledge, skills, tools and techniques to project activities to meet the project requirements. Project management shall be accomplished, to the greatest extent possible, through the appropriate application and integration of project management processes and process groups including: Initiating, Planning, Executing, Monitoring and Controlling, and Closeout.

C Effectively managing the project includes: Identifying requirements, addressing various needs, concerns, and expectations as the project is carried out; and balancing competing project constraints including, but not limited to: Scope, Quality, Schedule, Budget, Resources and Risk.

D Project Management Support shall enable the Authority to ascertain with a high degree of confidence the current and projected future status of execution of the contract.

E The Authority considers an effective project management program to be capable of identifying and addressing program issues at the earliest opportunity in order to minimize or eliminate Change Orders and changes

to the project plan or schedule. It is therefore incumbent upon the Contractor to have an established and fully effective project management program in place at the initiation of the contract. Project Management shall ensure that the project tasks are completed within scope, on time, and within budget.

F Project Management Support shall coordinate design and engineering activities. Project Management shall keep the Authority fully informed of the status of the project and shall promptly and regularly notify the Authority of any problems, difficulties, and risks that may impact the timely or effective completion of the task, milestone, or project. Risks shall further be analyzed and categorized as strengths, weaknesses, opportunities or threats.

G The Contractor's project management methods shall allow the Airports Authority's CO to ascertain that the Contractor shall meet the requirements of the contract documents, and shall enable the CO to monitor the contractual effort. The Contractor shall establish an organization to properly manage the PARCS implementation. The organization shall be highly responsive to the needs of the Airports Authority as required in this contract.

H Contractor's Project Manager (PM) – The Contractor shall designate a responsible individual, subject to approval by the CO, to serve as PM for the term of the contract. This individual shall preferably have at least ten (10) years prior experience in management of PARCS implementations and be familiar with design, sub-contractor equipment procurements, construction, test, and inspection of PARCS equipment. It is preferable that the PM have PMP certification.

I The Contractor's PM shall be responsive to the needs of the Airports Authority as required by the contract. The PM shall ensure that the project tasks are completed on time and within budget. The PM shall coordinate design and engineering activities, shall keep the Airports Authority fully informed of the status of the project, shall have the authority to make key project decisions and shall promptly and regularly notify the Airports Authority of any risks that may impact the timely or effective completion of the task, milestone, or project. The PM shall recommend any mitigation to risk and implement them as agreed by the Airports Authority.

J The Contractor shall submit in the Proposal the resume of the proposed PM for review and approval by the Airports Authority. The Contractor shall clearly outline the availability of the PM with any conflicts with existing or future project work. The Airports Authority has the right to request a replacement of the proposed PM should the resume or performance of the individual be deemed inadequate.

K Contractor's Installation Manager (IM) – The Contractor shall designate a responsible individual, subject to approval by the CO, to serve as the on-site IM for the entire term of the contract. This individual shall have prior experience with the hardware and software versions being installed for this project, have experience in management of PARCS installations and be skilled with design, sub-contractor equipment procurements, construction, test, and inspection of PARCS equipment.

L The Contractor's Project Management Plan shall clearly define the roles and responsibilities of the PM and the IM, the execution of the project and process for project control.

M Within thirty (30) days of NTP, the Contractor shall submit a Project Management Plan to the CO for approval CDRL 151. The Project Management Plan shall be updated as necessary to incorporate changes in the project or its schedule. The plan shall include but not be limited to:

1. List of Contractor staff, project roll, and contact information.
2. Outline of Contractor organizational structure.
3. The methods used for project scope management, time management, project cost management, project quality management, project human resource management, project communications management, and project risk management, This includes, but not limited to schedule, design reviews, technical performance, program changes, subcontracts, purchase orders, material procurement, in-service support, warranty, systems assurance analysis, tests, and demonstrations;
4. A description of the process to distribute information, managing stakeholder expectations (actively managing expectations to increase the likelihood of project acceptance by influencing desires to achieve project goals, addressing concerns in advance, clarifying and resolving issues), and reporting performance (Analysis of past performance, current status of risks and issues, work completed during the period, work to be completed next, summary of changes approved in the period, other relevant information). Additionally, a description of the process to track and control project correspondence shall be provided;
5. A Submittal List and Schedule listing drawings, documents, and data to be submitted for review and approval during the design review phase of the program and a schedule for the submittal of this information;
6. A Contract Deliverables Requirement List (CDRL) based on the information in this technical specification. The Contractor shall provide the format and description of how the submittal and completion of all CDRL's shall be executed. The CDRL shall contain the specific format of the deliverable, quantity, frequency, and contract paragraph reference as required. The CDRL shall be in accordance with the following column headings:
   a Item Number
   b Deliverable Description
   c Deliverable format(s)
   d Reference Section (i.e. location of requirement within the Contract Documents)
   e Scheduled Delivery Date(s)
   f Current Airports Authority acceptance status (i.e. pending, approved, conditionally approved, disapproved)
   g Quantity: Number of documents, units, or copies required
7. Master Project Schedule - The Contractor shall use the approved Master Project Schedule for executing the work for this contract. The Master Project Schedule shall be generated using a currently

supported version of Primavera Project Planner® for Windows, MS Project®, or other similar program approved by the CO. The Master Project Schedule shall conform to this Scope of Work and to schedule and delivery requirements set forth in the Terms and Conditions of this contract. In addition to printed copies, all submittals of the Master Project Schedule shall be provided on CO-approved electronic media.

N The Master Project Schedule shall include the following:

1. Work item descriptions that convey the scope of work indicated. Work items shall be discrete items of work that shall be accomplished under the contract. Work items shall include the scheduled dates for submittal and required response dates for approval of Contractor drawings and documentation. It shall include the schedule for design reviews, procurement of materials and equipment, fabrication of materials and equipment and their installation and testing, delivery of Airports Authority-furnished and other third party items and information, qualification tests and delivery, and testing of the PARCS. Estimated work item duration in whole working days shall be indicated for each work item of the schedule.
2. The sequence, successor, and predecessor interrelationships among work items shall be considered in developing the schedule and shall be so indicated.
3. Work item descriptions shall be accompanied by narrative explanation of what the work item comprises and the basis for the estimated work duration.
4. Sufficient detail shall be provided to indicate the manufacturing, testing, shipment, storage, and installation status of each PARCS device.
5. Testing and installation activities for the CDMS.

O A preliminary version of the Master Project Schedule showing key milestones and events, including those identified in the Contract Terms and Conditions, shall be submitted within thirty (30) days from NTP. CDRL 152

P The CO shall review the preliminary schedule and provide comments within thirty (30) days of receipt.

Q A final version of the Master Project Schedule shall be submitted to the CO within ninety (90) days from NTP. CDRL 153

R Monthly Progress Reports - The Contractor shall submit to the CO a monthly progress report by the fifth (5th) day of each month that covers activities for the previous month. CDRL 154 Monthly progress reports shall include elements of progress, risks and issues regarding the project.

S As part of each Monthly Progress report, the following shall be provided together with the baselined and approved Master Project Schedule highlighting:

1. Actual completion dates and start dates for activities planned and completed during the report period.
2. Estimated remaining durations for activities in progress.
3. Estimated start dates for activities scheduled to start during the six (6) weeks following the report period.

4. Requested changes in the durations of activities and logic changes for CO review and approval prior to incorporation in the baselined Master Project Schedule.
5. Workarounds needed to make up for schedule slippage, as necessary.
6. Requested additional activities not previously included in the Master Project Schedule for CO review and approval.
7. Work accomplished since previous report, including design status, fabrication problems, product delivery problems, schedule slippages, problems arising from proposed changes, and other circumstances which might affect progress of the work.
8. Existing or anticipated risks with suggested mitigation plans.
9. Any needed corrective measures to maintain the Master Project Schedule.
10. Engineering, manufacturing, and quality control reports.
11. Updated CDRL, including status of all deliverables.
12. Updated Submittal List and Schedule, including status of all submittals.
13. Updated action item log showing status of all action items.
14. Any other topics related to the project.
15. An executive summary that includes the work actually completed, the progress in terms of days ahead of or behind schedule, as well as percent completed.

T Project Document Control – The Contractor shall store and maintain all contract documents, project submittals, and correspondence in electronic form in a web-based system that shall restrict access to only authorized Contractor and Airports Authority personnel. The Contractor shall utilize the Airports Authority approved and provided web hosting services and administration to provide project document control as necessary.

U The Contractor and Airports Authority shall review the document control software and hosting services at the PDR. CDRL 155

V The Contractor shall obtain Airports Authority written approval at the end of each task or phase to proceed to the next task or phase outlined in this technical specification. Any deviations from the technical specification requirements that the Contractor requires in order to move to the next task or phase shall be noted in written form and signed by both the Contractor's PM and the Airport Authority."

20.2 **Project Meetings**

A Contract Start-up Meeting - Within fourteen (14) days after NTP, a Contract Start-up Meeting shall be held in the offices of the Airports Authority. In attendance shall be the CO, COTR, the Contractor's PM, and other appropriate Airports Authority and Contractor personnel. The Contractor's PM shall prepare an agenda which has been coordinated with the COTR. The Contractor's PM will prepare meeting minutes for distribution following this and all future meetings.. The Contract Start-up Meeting shall permit all parties to the contract to validate their understanding of the overall schedule, terms and conditions, scope of work, and responsibilities. In addition, the parties shall discuss and identify the items to be submitted for the design reviews.

B The Contract Start-up meeting shall allow the Contractor and the CO to coordinate their activities. At the meeting, the Contractor shall also present an overview of the intended solution design and identify an initial list of interface requirements.

C The Contract Start-up Meeting shall permit all parties to the contract to validate their understanding of the overall schedule, terms and conditions, scope of work, and responsibilities and also cover the following topics:

1. Review of PARCS technical specification.
2. Review of responsibilities.
3. Review of organization and sub-contractors.
4. Questions concerning errors, ambiguities, omissions in, and interpretations of specifications and drawings.
5. CO and Contractor to review and confirm the procedural requirements of the contract, including but not limited to:
   a Change Order procedures
   b Correspondence Logging
   c Documentation and submittal control procedures
   d Contractor to provide conceptual information on proposed equipment design, configuration and layout
   e CO and Contractor to review intended operations and maintenance requirements
   f CO and Contractor to identify interface requirements between CO and Contractor, especially regarding communications and installation interfaces
6. Contractor to identify information and decisions required by the CO.
7. Use of office, storage areas, construction areas, and temporary easements.
8. Deliveries and priorities of major equipment.
9. Safety, first aid, emergency actions and security.
10. Sequence of critical work and tentative schedule.
11. EEO and affirmative action requirements and community relations.
12. Insurance, laws, codes, traffic regulations, and regulations and permits.
13. Description of Quality Control process, including problem tracking, resolution and reporting.

D Job Coordination Meetings (JCMs) shall be held at least monthly, at the offices of the Airports Authority or the Contractor as selected by the CO; approximately one-half of the JCMs may be conducted via teleconference. The Contractor's PM, IM, and other appropriate Contractor and sub-contractor personnel, based upon anticipated agenda, shall attend either in person or via telephone conference call. The topics to be discussed and reviewed shall include all topics covered in the Monthly Progress Report.

20.3 Design Review

A General

1. Design Review meetings shall be conducted to evaluate the technical adequacy of the design and the compatibility with the performance requirements of the Contract. Design review meetings are intended to

serve as a technical review of Contractor progress toward meeting Contract requirements. At the completion of the review, the status of the review will be presented in the form of a statement of action items and schedule of accomplishment necessary to obtain the Authority concurrence with the program's technical progress.

2. The Contractor shall participate in Conceptual, Preliminary, and Final Design Review meetings with the specific objective to review and approve the Contractor's presentation of the preliminary system and final product design.

B Design Review Process

1. A comprehensive program of submittals and reviews shall be conducted for all aspects of the PARCS project. Three design reviews shall be held: Conceptual, Preliminary and Final to evaluate the progress and technical, functional, and programmatic adequacy of the PARCS system design in accordance with the performance requirements of the Contract. For these reviews, a series of documentation, samples, and demonstrations shall be submitted to the CO for review and approval.
2. The Contractor shall furnish the exact models of equipment and materials identified in CO-approved submittals unless otherwise approved by the CO.

C Design Submittal Requirements

1. Review Procedures for Drawings, Documents, and Data - The Contractor shall submit drawings, documents, procedures, and data in accordance with the Submittal List and Schedule provided in the Project Management Plan. The Contractor shall submit for review and approval all documents, data, assembly and installation drawings required to convey concept, design, dimensions, maintenance, operation, and overall assembly aspects and interfaces. Drawings shall be accompanied by material specifications, process specifications, and test data required permitting review and approval of the drawings. Detailed parts drawings need not be submitted unless requested by the CO to permit review of another drawing.
2. The CO reserves the right to reject, without review, any document that is not readily understandable due to lack of proper grammar, spelling, sentence structure, or punctuation. The Airports Authority is under no obligation to expend extraordinary effort to interpret poorly written or translated documents.
3. The CO reserves the right to request additional drawings, documents, or data, or any combination of documents, drawings, or data to support the review process. Other contract deliverables including material samples, manufacturing plan, test plans, test procedures, and analyses shall be submitted in the quantities specified. Parts may be manufactured prior to review and approval of Contractor submittals, however, the CO reserves the right to require changes to such parts at Contractor’s expense should the design(s) fail subsequent review.
4. Except as provided below, the CO shall respond to submittals within fourteen (14) calendar days after receipt. The CO shall respond to the Contractor via email and if requested and appropriate, at an address within the United States designated by the Contractor.

5. All Contractor submittals shall include a letter of transmittal. The submittal letter shall accurately list all drawing and document titles included in the submission. If the submittal includes revised documents, this information shall accompany the drawings, documents and data, clearly indicating that this is a re-submission.
6. No extension of contract time shall be allowed for revision and resubmission of Contractor's submittals that have been either "disapproved" or "conditionally approved." Such submittals shall be resubmitted and shall be reviewed and returned to the Contractor within the same time intervals as would be allotted to the drawings and documents when initially submitted. Drawings shall be submitted in an orderly and logical sequence to enable the CO to readily determine and review the interface relationships among elements and their subassemblies.
7. The Contractor shall maintain a record of Contractor and Sub-contractor submittal status. This shall include drawing and document numbers, revision letter, drawing title, date submitted, transmittal document, disposition, and the document number identifying the disposition. This status shall be updated not less than monthly and submitted to the CO as part of the Monthly Progress Report.

D Requirements for Drawings, Documents and Data – See Division 1 documents.

E System Configuration Management

1. The Contractor shall maintain strict control and records of all hardware and software design changes throughout the development, testing, production, and warranty periods.
2. The Contractor shall make no changes to the hardware design of any PARCS device, component, or subcomponent subsequent to FAT approval without written approval of the CO. The Airports Authority reserves the right to require the Contractor to repeat any portion of the testing program when the Contractor requests a post-FAT change to the hardware design.
3. When post-FAT hardware changes are required and approved, the Contractor shall submit a Hardware Update Plan for CO review and approval. CDRL 156 The Contractor shall then implement the approved hardware change according to the approved Hardware Update Plan.
4. Commencing with the As-installed Inventory, and throughout the warranty period, the Contractor shall maintain accurate records of the versions of all serialized components of the PARCS equipment, including all spare parts in inventory. After completing an approved hardware update, the Contractor shall submit a MS Excel® spreadsheet with an updated listing of the serial numbers and version numbers of the affected hardware components; this listing shall include the date the revision was applied to each item. CDRL 157
5. Whenever a hardware revision is applied, the Contractor shall update the hardware serialization labels, with the new revision information.
6. Software Versions and Configurations – Throughout the performance of this contract, the Contractor shall adhere to the software quality and

version control procedures submitted and approved as part of the QA plan.

F Application Software Changes

1. Upon successful completion of the FAT, all software shall be considered ready for revenue service. Any subsequent change to PARCS software shall be subject to strict testing and deployment procedures.
2. The Contractor shall submit all post- FAT software changes to the CO for review and approval. Accompanying each proposed software change, the Contractor shall submit comprehensive Software Release Notes for each proposed software release and maintain a master list of all releases and related dates. CDRL 158
3. Software Release Notes shall provide:
   - a A description of the change.
   - b Affected equipment and modules.
   - c A listing of the software modules updated by the release, including file names, version numbers, sizes, and checksums.
   - d A listing of all defects corrected, including references to Airports Authority correspondence(s) where applicable.
   - e A listing of all new features included.
   - f Copies of all test procedures and test results documentation.
   - g Complete installation instructions, including steps to verify proper installation and steps to remove the updated software.
   - h A deployment plan to implement the proposed change.
   - i Backup and restore process before change, User Acceptance Tests, procedures, and changes made in affected manuals.
4. The Airports Authority shall review the Software Release Notes, and upon approval, install the proposed software change in the PARCS test bed. Upon successful verification of the software change, the Airports Authority shall authorize the Contractor to deploy the software change according to the approved deployment plan included in the Software Release Notes.
5. The Contractor shall adhere to all Airports Authority provided change procedures.
6. When all software updates are installed, the Contractor shall provide a report (generated by the CDMS) confirming the successful deployment.
7. The version identifiers for all application software shall be unique. When the Airports Authority approves a software version in the PARCS test bed, the Contractor shall install the same software, with the same version identifiers, throughout the PARCS.
8. Configuration files, including parking fee-pricing tables and files governing operating parameters shall be similarly managed with strict version controls. Upon successful completion of the FAT, all configuration files shall be considered ready for revenue service. Any subsequent change to PARCS configuration files shall be subject to strict testing and deployment procedures.
9. Proposed post-FAT changes to any configuration file shall be subject to CO review and approval, and the Airports Authority verification in

the PARCS test bed. Upon CO approval and Airports Authority verification, the CO shall authorize the Contractor to implement the configuration update.

10. Once revenue service has commenced, the Airports Authority may make configuration changes without Contractor assistance, but the Contractor shall provide technical support when requested.

G All dimensions shall be expressed in the English or metric system; all wording shall be in the English language. All terminology used shall be conventional to the U.S. airport parking industry. All drawings submitted by the Contractor shall be CADD generated. Hand-drawn sketches shall not be accepted unless specifically requested by the CO. Schematics shall be comprehensive in nature and thoroughly detailed to permit use by Airports Authority maintenance and service personnel to troubleshoot and repair the equipment.

H Submittals shall include a title block with the following information:

a Contract number and title of the submittal.
b Date of drawing or revision.
c Name of project.
d Name of Contractor and sub-contractor submitting the drawing.
e Identification of contents and location of work, if applicable.
f Drawing number.
g Specification section reference.
h PDR, FDR, or CDRL reference number as defined by this specification.

I All submitted reports, manuals, and other documents furnished to the CO shall be sized to print on 8½” × 11” bond paper, or when a larger size is necessary, 11” × 17”. Other sizes require prior CO approval. All submittals shall be either in electronic form, Adobe® PDF or in the current MS Office® format.

J Unless otherwise approved by the CO, every drawing shall include a complete list of materials and parts lists on the field of the drawing or on a separate sheet of the same drawing, describing all parts or subassemblies, including sub-contractor-furnished items that form a part of the assembly, subassembly, or piece depicted.

K A revision block shall be provided for all documents, drawings, and data. The revision block shall identify the revision letter, date of revision, the initials of the Contractor’s responsible engineer authorizing the revision, a description of the change, and the reason for making the change.

L Submittals Requiring Approval

1. Documents, drawings and data to be furnished by the Contractor for approval by the CO shall include all information conveyed for the design review meetings, including their completed, final form and all other submittals described in this contract. The CO reserves the right to request additional documents and/or drawings as required clarifying and amplifying the intent or meaning of documents and/or drawings furnished.

M Approval of Contractor Submittals

1. The CO's approval or disapproval shall be provided in one of the three following categories:
   a Approved as submitted.
   b Conditionally approved. The Contractor may proceed in accordance with changes indicated and shall revise and resubmit the document, drawing, and data for CO approval.
   c Disapproved. The Contractor shall revise and resubmit the document, drawing, and data for CO approval prior to commencing the affected portion of the work.
2. The approval by the CO of any design submittal does not imply that the Airports Authority has accepted any responsibility for the Contractor's design or that the Airports Authority has accepted any item of equipment or material. Approval of any submittal does not relieve the Contractor of the obligation to meet all of the requirements of the contract. Approval of any design submittal that contains implied or explicit deviations or exceptions to the contract documents does not constitute the Airports Authority's approval of the deviation or exception. Only deviations and exceptions that have been formally approved through the contract change order process shall alter the Contractor's obligations under this contract.
3. At the CO's sole discretion, design review submittals may be waived upon written request from the Contractor and sufficient written proof that the submittal represents equipment or designs that are substantially unchanged from previous products or components. Requests for submittal waivers and accompanying evidence shall be presented at least thirty (30) calendar days prior to the scheduled submittal due date. Submittal waivers may also be established during the Contract Start-up meeting.

N Design Review Requirements

1. Design review meetings as scheduled in the approved Management Plan shall be held in which the Contractor conducts a presentation in accordance with a previously approved agenda. In its presentation, the Contractor shall address design approaches, concepts, and design details. During these design review meetings, action items shall be identified, with each action item assigned to an individual for disposition by a pre-determined response date. All action items identified during the design reviews shall be recorded in the Review Action Item Log that shall be provided to the Contractor by the Airports Authority.
2. At least fourteen (14) calendar days prior to each design review meeting, the Contractor shall submit the agenda and a data package covering information to be addressed in the meeting CDRL 159.
3. Attendance at design review meetings shall include representatives of the Contractor and appropriate sub-contractors and the CO or its representative.

O Conceptual Design Review (CDR)

1. The objectives of the CDR shall be to familiarize the Authority with Contractor's intended design and procurement activities, resolve external interfaces, confirm options and provide the basis for

proceeding to PDR. All Submittals required prior to the CDR shall be submitted in the Conceptual Design Review Package (CDRL 160).

2. The CDR shall cover the following:
   a Provide a functional block diagram of the system and equipment.
   b Provide all CDR items indicated in Appendix B.
   c Provide narrative descriptions of the major subsystems proposed by the Contractor.
   d Provide preliminary equipment layouts.
   e Identify all interfaces between the major subsystems, provide a schedule, and identify responsibilities for completion of detailed definition of the interfaces.
   f Confirm that the Contractor is familiar with the intended operations and maintenance environment.
   g Provide physical dimensions of each equipment type.
   h Identify power and other facility requirements for each equipment type. Identify information needs and decisions required from the Authority.
   i Information Technology components, architecture, their interaction with each other, and its associated data flow.

P Preliminary Design Review

1. As scheduled in the approved Management Plan, the Contractor shall conduct a Preliminary Design Review (PDR). The PDR shall be held at the Airports Authority's offices or, at the CO's discretion, at the offices of the Contractor in the United States, as identified in the Contract Milestones.
2. The objective of the PDR is to perform a detailed review the initial design documents created by the Contractor, identify designs that need to be added or modified, and clarify functionality and system requirements raised by the Contractor. All submittals required prior to the PDR shall be submitted in the PDR Package. CDRL 160
3. The PDR Package shall cover the following:
   a Provide a functional block diagram of the system and equipment.
   b Provide narrative descriptions of the major subsystems proposed by the Contractor.
   c Provide preliminary equipment layouts.
   d Identify all interfaces between the major subsystems, provide a schedule, and identify responsibilities for completion of detailed definition of the interfaces.
   e Confirm that the Contractor is familiar with the intended operations and maintenance environment.
   f Provide physical dimensions of each equipment type.
   g Identify power and other facility requirements for each equipment type.
   h Identify information needs and decisions required from the Airports Authority.
   i Schedule compliance review and discussion of variances or delays.

- j Complete customer and operator interface drawings, flow charts, detailed screen flows with actual screen shots, report designs and layouts, server graphics, messages and menus, including accommodations of all operating boundary and error conditions.
- k Detailed technical descriptions of the PARCS major components.
- l Detailed mounting arrangements and installation methods.
- m Single-line power diagrams and functional block diagrams for the PARCS.
- n Detail specifications for all data communications interfaces. This includes conceptual, logical, physical and implementation models for all information technology layers (server, network, storage, datacenter, database, application, service, UX and integration
- o Complete data dictionary and all file formats for all data tables.
- p List of special tools.
- q Description of operational and physical compatibility with the existing equipment and equipment installations.
- r Design of access control for the following:
  - i Revenue handling system
  - ii Software menus
  - iii Software system-level flow charts
  - iv Software data backup and recovery procedures
  - v Software design descriptions (top level of software documentation) for all programmable equipment and systems

Q Final Design Review

1. The CO shall notify the Contractor within thirty (30) calendar days after the PDR those submittals from the PDR that shall be resubmitted in greater detail for the Final Design Review (FDR).
2. The FDR shall take place when the design is essentially complete, and as scheduled in the approved Management Plan. The FDR shall provide the Airports Authority the opportunity to review, revise, and agree on the details of the final design prior to release of the designs for manufacture. FDR submittals shall include finalized submittals of all required drawings, documents, and data.
3. Upon receipt of final design review submittals, a FDR meeting, as scheduled in the approved Management Plan, shall be held at Airports Authority offices, or at the CO’s discretion, at another approved location in the United States. The FDR meeting shall be held as identified in the Contract Milestones.
4. All submittals required prior to the FDR shall be submitted in the FDR Package. CDRL 162
5. The FDR Package shall cover the following:
   - a Schedule compliance review and discussion of variances or delays.
   - b Provide all FDR items indicated in this specification and all required PDR submittals.
   - c Shut-down and start-up sequences.

d Assembly drawings down to the lowest replacement unit level.

e Electrical schematic drawings, down to the individual signal or wire level, for each electrical circuit as required for the Airports Authority to maintain equipment.

f Technical and functional software design documentation at the second level, consisting of structured data flow diagrams to the lowest level of decomposition with software module descriptions (or elemental process descriptions) in structured narrative format. The second level of software documentation is one level above source code and shall include descriptions for each equipment type.

g Information Technology physical design models (for all layers) that shows, describes and meets MWAA's security, compliance and operational capabilities.

h Input data definitions.

i Output data definitions.

j Diagnostic routines for system level and subsystem level self-test.

k Data dictionary.

l Final Engineering Drawings.

6. The FDR shall be deemed complete after the FDR has been approved by the Airports Authority. At that point, Contractor shall commence with the development of the PARCS equipment and software to meet the contract requirements.

20.4 **Testing**

A This section describes the requirements for the submittal of detailed inspection and testing plans and procedures for the facilities at which tests shall be conducted. During all facets of testing, the system shall meet or exceed requirements as defined Section 24 PARCS Performance Standards. This includes, but not limited to, FAT, Post Installation Testing, 30 Day Operational Acceptance, and Final System Acceptance Testing.

B Factory Acceptance Test

1. The FAT test shall demonstrate satisfactory operation and performance of all components (a representative sample of overall quantity) of equipment interconnected to simulate the configuration of components, systems and subsystems as required herein using the Authority's rates, discounts and promotions.
2. The Contractor shall provide the testing plan, test schedule and test script formats for all Factory Acceptance Testing (FAT) to be submitted to the Airports Authority that shall be approved by the Airports Authority prior to start of the tests.
3. The Contractor shall provide all test and diagnostic equipment including special tools, electronic equipment, meters, laptop computer with appropriate software and communication ports, Radio Frequency (RF) field and signal strength meters, transceivers, etc. necessary to conduct all tests, measure and record results, isolate, diagnose and de-bug deficiencies, and to generate reports and documentation of test results.

4. The Contractor shall provide sufficient number of PARCS tickets, testing media and test credentials, properly encoded and prepared to test all specified features, devices, test bankcards of all major U.S. bankcard brands and other stock materials and consumables required for all test sequences.
5. Thirty (30) days prior to testing the Contractor shall provide samples of all screen views associated with the LPR software. The screen views samples shall include all workstation review functions and shall include data to provide an understanding of the review process.
6. The Contractor has the option to conduct the FAT on the Airports Authority's premises using the PARCS test bed or at the Contractor's facility.
7. The Airports Authority's representatives shall attend the FAT. The Contractor shall notify the Airports Authority in writing at least twenty-one (21) days prior to the FAT to confirm the dates and that all components and functionality shall be ready for testing. Any exceptions shall be included in the written confirmation and the Airports Authority shall determine if the FAT shall be delayed due to any noted exceptions. Fourteen (14) days prior to the FAT the Airports Authority shall receive from the Contractor confirmation in writing or email that all devices and functionality are operating and ready for testing. The Contractor shall bear all additional costs incurred by the Airports Authority and its representatives for any delays in the original FAT schedule and/or if the Airports Authority and its representatives are required to return to the FAT test site for additional testing.
8. Inspections and tests observed by the Airports Authority's representatives shall not relieve the Contractor of responsibility for providing hardware, software and documentation in accordance with this Specification.
9. The FAT test shall demonstrate satisfactory operation and performance of all components of equipment interconnected to simulate, in an online and offline environment, the configuration of components, systems and subsystems as required herein using the Airports Authority's rates and discounts. The FAT shall be performed prior to delivery of production components to site, using components specifically manufactured to meet the requirements of these specifications. Representatives of the Airports Authority shall observe testing. All third party devices or subsystems required for a fully functional simulation shall be provided and installed by the Contractor for this test.
10. Components shall be interconnected and shall provide on-line data communication with software produced for this project. At least one (1) fully operational simulated entrance lane and exit lane with all required devices shall be included in the FAT. The software shall be fully integrated with all components and shall properly acquire, compile and provide all required reports of transactions, system activity and alarms, and shall demonstrate all required data security and password authorization features.
11. Transaction times, device response times, time-out operations, and all other performance criteria that can be measured without resorting to

excessively numerous transactions shall be measured for compliance to the specifications.

12. Network shall be configured as on-site, to allow for proper ports and protocol setup.
13. The FAT shall exercise all functional and performance features of devices, subsystems and systems as required by these specifications both in online and offline modes.
14. The FAT shall include production of all required system reports using data generated from transactions, activities, violations and alarms produced during the FAT as specified in these specifications.
15. The Contractor shall prepare FAT scripts with expected results and submit for Airports Authority approval thirty (30) days prior to the scheduled FAT. Contractor shall modify the FAT scripts as requested by the Airports Authority. CDRL 163
16. The Contractor shall provide bound hard copies of the FAT scripts on the first day of the FAT for all participants. The script shall provide Pass/Fail and Comments columns for each test item. Each FAT script shall have test signature lines for Contractor and Airports Authority representatives. After each script is completed, the Contractor and Airports Authority shall review and document the test status of each test item and both parties shall sign the script indicating agreement of FAT results.
17. The Contractor shall correct deficiencies in components, subsystem or system design, manufacture or installation as required, and re-test in accordance with this section until satisfactory results are achieved.
18. If the components or features are not available or properly functioning at the FAT, the Airports Authority may stop the FAT and resume testing after the Contractor has remedied the problems. The Contractor shall bear all costs associated with extending or rescheduling the FAT including travel and labor costs for the Airports Authority and its representatives.
19. Approval of results of FAT by the Airports Authority shall in no way relieve Contractor from providing PARCS in full compliance with the requirements of these specifications. Approval of FAT shall not limit the Airports Authority’s right to later require changes to components, subsystems and systems, including PARCS reports to satisfy requirements of these specifications.
20. At the end of the FAT, the Contractor shall provide the Airports Authority with a Factory Acceptance Testing Report. The Report shall identify all gaps in functionality and all issues that the Contractor shall be committed to resolving that have arisen from the FAT. CDRL 164

C Transition from FAT to Installation

1. The Contractor shall not commence to the next phase, Installation and Testing, until all items identified in the Factory Acceptance Testing Report have been approved and signed off by the Airports Authority, or an exception has been granted by the COTR.
2. At the end of the FAT, the server built for the FAT shall not be the server put into Production on the Airports Authority’s premises. A clean server shall be used and built for Production only. At the end of the FAT, the Contractor shall document the server versions and data used in the FAT. The Contractor shall sign off on the server build and

data used in the FAT in order to have an agreed server build knowledge to compare for Production. CDRL 165.

D Post-Installation Tests

1. After the installation and connection of components, the Contractor shall test the PARCS Equipment and shall support Post-Installation Testing in accordance with the Master Program Schedule.
2. CDMS Operational Test
   a After the installation and successful testing of the CDMS and the PARCS test bed in accordance with the testing described in this Post Installation Services section, the Contractor shall conduct a comprehensive test of the CDMS to include, but not be limited to:
      i Communications with all PARCS equipment in the PARCS test bed.
      ii Communications with any necessary external system, including but not limited to the bankcard clearing house and RMS interfaces.
      iii Transaction tests using test payment media of all forms and all transaction types.
      iv Generation of database reports to confirm that all test transactions are properly recorded and reported.
      v A failover test to the disaster recovery CDMS and a fail back test to the primary production CDMS.
      vi System administration tasks, including backups and restores, user login management, system configurations, equipment addition and deletions, workstation administration, and all other administrative functions that are site-specific.
3. Bankcard System Certification
   a Using the PARCS test bed and the CDMS, the Contractor shall perform a bankcard system certification test, in accordance with the Airports Authority's contract with the bankcard transaction clearing house service provider.
   b The Contractor shall test the bankcard payment activation process from end-to-end to ensure all accepted bankcard are successfully sent to the payment processing center. These tests shall be completed while the central server is in both online and offline status.
   c The Contractor shall coordinate with the bankcard clearing house and Airports Authority to perform server communications tests. This test confirms correct communication from the lane device to the bankcard server, to the payment processer (if applicable), to the clearinghouse. Each component of this communication path shall be tested – first with all components online, and then taking individual components offline to confirm data buffering and offline notification functionality.
   d Certification testing shall confirm:
      i Compliance with EMV standards in effect.
      ii Compliance with the Airports Authority's bankcard clearing house procedures and communication protocols.

    iii Transaction processing of valid and invalid bankcards.
    iv Transaction processing of valid and invalid debit cards.
  e Installation of PARCS field equipment is contingent upon successful conclusion of the CDMS Operational Test and the Bankcard System Certification; the Airports Authority shall have sole jurisdiction over determining whether the Contractor has passed these tests.

4. Post-Installation Inspection by Contractor
  a After installation of each PARCS field device, the Contractor shall inspect each device to confirm that the equipment is properly installed, interfaces properly with the CDMS, and performs as intended. The Airports Authority may witness all Post-installation Inspections at its discretion.
  b All installed equipment shall undergo, at a minimum, inspections for the following:
    i Completeness and quality of installation.
    ii Damage to equipment.
    iii Missing components and parts.
    iv Correct power and data communication connections.
    v Correct positioning and mounting.

5. Post-Installation Field Test by Contractor
  a After the Contractor has installed all of the equipment in a lane, the Contractor shall perform a Post-Installation Field Test (i.e. Field Test) to confirm that the communication and functionality of the devices in the lane are operating as required.
  b Thirty (30) days prior to the first Field Test, the Contractor shall submit a Field Test Script for each device for the Airports Authority's review. The script shall be completed by the Contractor and submitted prior to the Airports Authority's lane test. The Contractor shall modify the scripts as requested by the Airports Authority. CDRL 166
  c The Contractor shall test all features and functional performance requirements of equipment in accordance with the Field Test Scripts.
  d The Field Test Script shall include all individual lane equipment, communications networks, subsystem controllers, computer, workstations and core reports.
  e The Contractor shall test, calibrate and verify the correct installation and operation of all PARCS equipment, hardware, network, and accessories installed as part of the Field Test.
  f The Contractor shall calibrate each connected PARCS device by making a comparison between the device's function at its location and the graphic activity display at the main operator's workstation.
  g The Contractor shall check each control point by making a comparison between the control command given at the main operator's console and the response of the field controlled device.
  h The Contractor shall verify proper operation of all device failure modes.

- i The Contractor shall verify that on loss of power, PARCS CDMS equipment and field devices are kept online by their dedicated and individual UPS/battery backup systems. The UPS and battery backup systems shall automatically disengage when either emergency power comes online or normal power is restored. When emergency or normal power is provided, PARCS shall reinitialize communications links and field equipment and devices.
- j The Contractor shall submit the results of each Field test to the Airports Authority within one (1) business day after the test was conducted. The lane shall remain closed until after the successful completion of the Airports Authority's Lane Test.

6. Lane Acceptance Test
    - a The Airports Authority shall prepare the Lane Test scripts and conduct the Lane Test after the Contractor successfully completes Post-Installation Field Testing for each lane and PARCS component (e.g. LPI, etc.) and submitted the completed Field Test script with test results to the Airports Authority.
    - b Lane testing, as defined in the Installation and Cutover Plan CDRL 167, shall fully test the equipment and systems installed at each installation location prior to full operation of system. The purpose of the lane test is to demonstrate that installed components systems and features are fully functional as specified.
    - c The Contractor shall provide one (1) staff member with full knowledge of the PARCS devices and functionality to attend the Lane Tests to assist with any problems.
    - d The lane tests shall replicate FAT test results on installed equipment and systems. The Contractor shall track and obtain sign-off of each individual lane test that is completed.
    - e For each Lane Test, the Contractor shall provide the number of test tickets, test media and test credentials (including status set up) as requested by the Airports Authority.
    - f The Airports Authority shall test all installed equipment and systems at each location (entrance, exit, or office location) to confirm that the components installed at each location are fully operational as specified.
    - g After a successful lane test, the Airports Authority shall commission the lane (i.e. open for public use). The Airports Authority reserves the right for the lane to operate for a period of time prior to releasing other lanes to the Contractor for installation.
    - h During the installation phase, the Contractor shall have a qualified and experienced technician on site available to troubleshoot issues eight (8) hours per weekday day. Outside of this standard support time, the Contractor's technician shall be on call to respond by phone within fifteen (15) minutes and to arrive on site within one (1) hour from the time of the Airports Authority's initial call.
7. 30-Day Operational Acceptance Test

a Upon successful completion of all lane tests, demonstrations and training required herein, the Airports Authority shall operate the complete system for a test period of not less than thirty (30) days. When installation is phased, completion of all installation tests, demonstrations and training of each phase shall be designated at the beginning of the 30-day operational test period.

b The Contractor shall have a qualified and experienced technician on site available to troubleshoot issues eight (8) hours per weekday day during the 30-day operational test. Outside of this standard support time, the Contractor's technician shall be on call to respond by phone within one (1) hour and arrive on site within four (4) hours of the Airports Authority's initial call.

c The Contractor shall record all test data on electronically so as to provide a continuous log of systems performance that is electronically sortable for each field and that include the following:

   i Date and time for all entries.

   ii Name of individual performing entry.

   iii Environmental conditions.

   iv Airports Authority activities in process.

   v Description of all alarm annunciations, responses, corrective actions, and causes of alarms. Provide an alarm code so that types of alarms can be consistently applied to each event and can be sorted by code.

   vi Description of all equipment failures, including software errors. Provide a failure code so that each type of failure can be consistently applied to each event and can be sorted by code.

   vii Description of all maintenance and adjustment operations performed on system. Provide a maintenance/adjustment code so that each type of maintenance can be consistently applied to each event and can be sorted by code.

   viii Daily and weekly tabulations.

   ix The Project Manager's representative designated to observe monitoring of system shall review daily entries of performance data.

d For the 30-day operational acceptance test, the following shall apply for failures:

   i All PARCS modules and sub-systems shall be fully operational as an integrated system without downtime. For each downtime period of four (4) hours or more within a twenty-four (24) hour period, one (1) working day shall be added to the operational acceptance cycle.

   ii All test reports shall correlate 100% with gross and net revenue processed at each point of sale device for the test period. For inaccurate or unavailable data impacting revenue reconciliation or revenue collection and inaccurate data on the Shift Reports, Detail Transaction Report,

Exception Transaction Report, Daily Revenue Summary Report, or the Bankcard Reports, one (1) working day shall be added to the test schedule for each day there is such an event or report error.

e The Contractor shall demonstrate the ability to process transactions of a size common to Dulles Airport. Volume testing may be required at the Airports Authority's discretion.

8. Remediation Testing

a Upon successful completion of the 30-day operational acceptance test, a remediation test phase shall commence to remedy any fault or deficiency discovered during the 30-day operational test phase.

b The final system acceptance test phase shall not commence until the Contractor's PM has documented and notified the Airports Authority of the resolution of all known deficiencies resulting from the 30-day operational test phase and has received approval from the Airports Authority to proceed.

9. Final System Acceptance Testing

a The final system acceptance test phase shall begin after successful completion of the following:

i The remediation test phase.

ii After training as specified has been completed.

iii After receipt of written start date notification is received from the CO.

b The Contractor shall provide on-site personnel to respond to PARCS issues in accordance with the 30-day operational test phase.

c The Contractor PM shall monitor all systems during acceptance testing in coordination with the CO in a format approved by the Airports Authority.

d The Contractor shall record all test data on approved database driven forms to provide a continuous log of systems performance that include the same data as collected during the Operational Test.

e For acceptance testing purposes, the following shall apply for failures:

i A device failure that impacts operations, resulting in a loss in revenue, or requires the device to be out of service for more than four (4) hours, one (1) day shall be added to the test schedule for each occurrence.

ii Inaccurate or unavailable data impacting revenue reconciliation or revenue collection and inaccurate data on the Shift Reports, Detail Transaction Report, Exception Transaction Report, Daily Revenue Summary Report, or the Bankcard Reports, one (1) day shall be added to the test schedule for each day there is such an event or report error.

iii System failure of one or more modules, sub-systems or the core reports that would impact revenue collection is considered a system failure. As a result, the Airports

Authority has the option to suspend the acceptance test and the Contractor shall have fourteen (14) days to remedy the system failure before a new 30-day test cycle shall commence at the Contractor's expense.

f The Airports Authority shall reserve the right to terminate testing at any time when the system fails to perform as specified. Upon termination of testing, the Contractor shall commence an Airports Authority defined assessment period.

10. Acceptance Testing Phases

a The Contractor shall provide the Airports Authority with an Acceptance Test Plan (CDRL 168) thirty (30) days prior to the 30-day operational test. The Acceptance Test Plan shall include all acceptance test phases (operational, remediation, final testing, and final acceptance). The Acceptance Test Plan shall include the overall testing plan, the detailed test procedures, the documents and tools that shall be used to record the test results and the report document used to summarize the test results. Within ten (10) days after completion of each acceptance test phase the Contractor shall provide the Airports Authority with all test outputs specified in the Acceptance Test Plan.

b Phase 1 – 30-day Operational Testing

i Time: Twenty-four (24) hours per day for thirty (30) consecutive calendar days.

ii Make no repairs during this phase unless authorized in writing by the Airports Authority's COTR.

iii System failures that prevent basic operations such as server malfunctions, bankcard system failures, or system wide network failures shall result in termination of the acceptance test and upon remediation, testing shall begin at day one (1). If the PARCS experiences no failures, proceed to Phase 3 – Final Acceptance Testing.

c Phase 2 – Remediation by Contractor

i After the conclusion of Phase 1, the Contractor shall summarize the Acceptance Test Phase 1 failures and submit to the Airports Authority for review and approval. The Contractor's results submittal shall include the nature of each failure, corrective action taken, results of tests performed to verify corrective action as being successful, open items that are not corrected, plan and timeline for resolving open items, and recommended point for resumption of testing.

ii After submission of a report, the Contractor shall schedule a review meeting at the job site at a date and time scheduled by the CO.

iii At review meeting, the Contractor shall demonstrate that all failures have been corrected by performing verification tests.

iv Based on report and review meeting, the CO shall direct the Contractor to repeat Phase 1, restart Phase 1, or proceed to Phase 3 – Final Testing.

d Phase 3 – Final Acceptance Testing

i Time: Twenty-four (24) hours per day for thirty (30) consecutive calendar days.

ii Make no repairs during this phase unless authorized in writing by the CO.

e Phase 4 – Final Assessment

i After conclusion of Phase 3 or termination of testing, the Contractor shall identify all failures, determine causes, and repair, submit explanation of the nature of each failure, corrective action taken, results of tests performed, open items that are not corrected, plan and timeline for resolving open items, and recommended point for resumption of testing open items.

ii After submission of report, a review meeting shall be scheduled to be held on site at a date and time scheduled by the CO.

iii At review meeting, the Contractor shall demonstrate that all failures have been corrected by performing verification tests.

iv Based on report and review meeting, the CO shall approve acceptance test or direct successful proposer to repeat all or part of Phases 1 and 3.

11. Disaster Recovery Exercise

a After successful completion of the Phase 1 30-day operational test, the Airports Authority and the Contractor shall jointly perform a Disaster Recovery Exercise wherein the activities of the production CDMS are temporarily transferred to the Disaster Recovery site. The Contractor shall deliver a Disaster Recovery Plan (DRP) to the CO outlining the all procedures for recovery in the event of a disaster (see CDRL 129) While the Disaster Recovery site is functioning, at least five (5) entry and exit transactions shall occur as well as testing integrations with systems determined by the CO. After confirming proper operation of the Disaster Recovery site CDMS, operations shall then be transferred back to the production CDMS.

b During and after the exercise, the Airports Authority and the Contractor shall confirm integrity of the CDMS database. This shall include proper synchronization of the databases reflecting all data from transactions during the test properly reside in the production CDMS database.

20.5 **Training**

A The Contractor for shall prepare a training course for the Authority and/or Authority designated Cashier, Supervisor, Maintenance Technicians, System Administration, CDMS User, CDMS Administration, and Accounting and Auditing staff.. The training shall provide the Authority personnel with information and skills needed to instruct the Authority line personnel to operate, maintain, and support the PRCS equipment to the lowest replaceable component level. The detailed training program curriculum shall ensure the Authority is fully qualified to operate and maintain all systems...

B The Contractor shall submit resumes of trainers assigned to this project. All trainers shall be fluent in English, possess clear communication skills, shall be familiar with PARCS technical information and all hardware and software functions, and shall be able to utilize proper methods of instruction, training aids, audiovisuals, etc. to provide effective instruction. The Airports Authority may request the replacement of any trainer at any time.

C The Contractor shall submit the Training Plan to the Airports Authority for review at the PDR and approval at the FDR. CDRL 169 The Contractor shall digitally record (to MP4 or other standard format) at least one (1) training session of each course, and provide a DVD of all such recordings at the conclusion of each class. CDRL 170 The Contractor shall permit the Airports Authority or its designated representative to record all training sessions. The Airports Authority shall have unrestricted use of all video records and not be subject to any use fee.

D At the completion of training courses, all trainees must take and pass a written test as an indication that key training points are understood by the trainee. Trainees must repeat a course until able to pass the written test.

E When the first entry and exit lane are open for operation, the Contractor shall provide a staff person knowledgeable with the PARCS onsite for the first twenty-four (24) hours of operation to assist with Airports Authority questions and PARCS problems.

F In addition to formal training courses, the Contractor shall provide informal field training while conducting on-site technical support services during the initial revenue service period.

G At the Airports Authority's request and expense, the Contractor shall, during the warranty period, provide additional repeated sessions of any of the courses provided under this contract.

H The Contractor shall conduct all training courses according to Airports Authority personnel schedule availability and as approved by the CO. All training shall occur not more than two (2) weeks prior to revenue ready approval. Course schedules shall avoid overlap and concurrency so that Airports Authority personnel can participate in all courses.

I The hours for each training course contained herein are approximations only. Training courses shall provide the scope of instruction as specified below. The Contractor shall define the time required to provide the specified training in the preliminary training plan, which shall identify the target audience for all courses to be taught, location for each, estimated training hours, class sizes, presumed student prerequisite skills, and the development and delivery schedule for each. The preliminary Training Plan shall be provided at the PDR.

J Training shall be conducted at a location approved by the CO. Hours for training shall be between 7:00 AM and 7:00 PM, Monday through Friday, unless otherwise specifically requested by the Contractor and approved by the CO a minimum of not less than twenty-one (21) days prior to the scheduled training. Training shall be limited to a maximum of eight (8) hours per training session per day.

K For each course, the Contractor shall prepare and submit for Airports Authority approval, a course schedule and curriculum in MS Word format.

The training shall provide the Airports Authority personnel with information and skills needed to instruct the Airports Authority line personnel to operate, maintain, and support the PARCS equipment to the lowest replaceable component level. The Contractor shall submit for the CO's review and approval Training Curricula as part of the FDR. The curricula shall meet all training requirements and indicate course content, training time requirements, pre-requisites, minimum skills and the attending job roles.

L The Contractor's trainer(s) shall meet with the CO no later than sixty (60) days prior to the start of formal training. At that time, the Contractor shall submit lesson plans and an outline of each training session, as well as demonstrate any training aids involved. CDRL 171 Instructional Training Materials shall also be presented for approval and provided later in a ratio of one (1) per student.

M The Contractor shall customize all training programs, courses, and manuals for the Airports Authority. The customization effort shall include the Airports Authority-specific rules and procedures as they relate to the operation and maintenance of the PARCS equipment.

N The Contractor shall develop and provide all training aids, student workbooks, guides, audiovisual equipment and visual aids necessary to conduct these courses. To the greatest extent possible, the training materials shall include the manuals and documentation as identified in Section 17.

O All training materials developed or used by the Contractor to conduct these instructional sessions shall become the property of the Airports Authority at the conclusion of training.

P Two (2) copies of the Instructor's Guide, which contain all the information and direction necessary for instructors to make an effective presentation, shall be submitted at least sixty (60) days prior to the scheduled date of the commencement of training. CDRL 172 It shall include adequate guidelines to conduct a comprehensive training program. Individual lessons within the course shall be organized as separate blocks (or modules), which may be taught as a unit. In some instances, the same module may be used in more than one course. The Instructor's Guide shall contain, at a minimum:

1. Student prerequisite knowledge and/or experience.
2. Program overview.
3. A statement of overall program goals.
4. Lesson plans (a session-by-session outline containing the following):
    - a Student learning objectives, stated in measurable terms
    - b Overview of each lesson
    - c Suggested instructional methods/learning activities
    - d Required equipment and/or resources. This shall include graphics or charts as needed to make effective presentations.

Q At least thirty (30) days prior to the scheduled date for the commencement of training, the Contractor shall supply all Student Instructional Materials, to include all materials for the student to interact in the learning situation and shall be included in CDRL 173. Student Instructional Materials shall contain, at a minimum:

1. Course overview and introduction.

2. Statement of overall course goals.
3. Learning objectives, stated in measurable terms, the knowledge to be gained.
4. A fully developed prose treatment (not outline format) of content presentation, developed in the same modular format as the Instructor's Guide.
5. Illustrations, charts, or graphics, as needed to enhance content presentation.
6. Problems and questions related to lesson content, as appropriate.

R The Contractor shall provide written and hands-on practical tests or other evaluation devices designed to measure the extent to which students have met the learning objectives, with an answer key for each of the tests developed.

S The Contractor shall provide sufficient training equipment to allow for no more than two (2) Airports Authority-approved personnel per Cashier Station.

T Maintenance Technician training shall commence only after delivery and installation of the PARCS test bed and provision of all training materials, special tools, and test equipment.

U Training materials shall reference and incorporate the content of the Operations and Maintenance Manuals where appropriate.

V Practical training on equipment shall occupy a significant portion of all training classes. Training shall be held on the Test Bed equipment or the operational equipment. This shall be determined during the PDR. If needed, the Airports Authority shall provide a training room environment that includes internet access, power and a projector for the Contractor to use for training purposes. The Contractor shall use equipment intended for the PARCS to set up the training environment in the provided facilities which shall later be distributed to its intended location. The Contractor may utilize uninstalled Airports Authority-owned project PARCS equipment if applicable.

W "Train the Trainer" instruction forms the basis for the Airports Authority's delivery of ongoing training to the Airports Authority's line personnel. For each course indicated in Table 4, the Contractor shall provide a "Train the Trainer course". The Train the Trainer courses shall be designed to train instructor and supervisory personnel at the Airports Authority to deliver any of the indicated training courses subsequent to the Contractor's involvement. At the completion of training, the Airports Authority trainers shall demonstrate competency in the operation of PARCS by successful achievement on performance and written examinations.

X The approximate number of staff to be trained in each group, and the number of classes for each group are as follows:

1. Cashier Training
   a The number of cashiers selected by the Airports Authority shall be trained in the general operation of PARCS equipment, with each cashier participating in two sessions. The first series of classes shall be conducted in the two (2) weeks immediately before installation and activation of the new PARCS equipment

and shall consist of general system introduction and basic knowledge necessary to operate the PARCS. The second session shall be held shortly after each cashier has had experience with the new PARCS equipment in an operational mode.

b The length of each training class shall be defined in the Contractor's curriculum as approved by the Airports Authority. Each training session shall be provided at approximately five (5) different time periods including all shifts (day, swing, and graveyard) to ensure all staff can participate without undue loss of staffing for normal operations.

2. Supervisor Training

a The Airports Authority shall decide the number of supervisory personnel who shall be trained in the operation of all components of the PARCS, with each supervisor participating in two sessions. The first series of classes shall be conducted in the two (2) weeks immediately before installation and activation of the new PARCS equipment and shall consist of a detailed system introduction and detailed knowledge necessary to operate the system. The second session shall be held shortly after each supervisor has had experience with the new PARCS equipment in an operational mode.

b The length of each training class shall be defined in the Contractor's curriculum as approved by the Airports Authority. Each supervisor training session shall be provided at approximately five different time periods including all shifts (day, swing, and graveyard) to ensure all staff can participate without undue loss of staffing for normal operations

3. Maintenance Technician Training

a The number of Technicians selected by the Airports Authority shall be trained in the operation of all components of the PARCS. Informal training of the electronic technicians shall commence with the delivery, installation, and testing of the lane equipment. Formal training of the electronic technicians shall commence in the two (2) weeks immediately before activation of the new PARCS equipment.

b The quality of instruction shall be such that the trainees shall be able to maintain the system on a component replacement basis and to the Contractor's satisfaction in regard to the warranty requirements.

c For each PARCS device, including each element of the CDMS and all communication interfaces, the Contractor shall provide a maintenance course.

d The course shall include sessions in safety, equipment operation, and a comprehensive seminar on learning basic skills/knowledge of each operation. The course shall include both classroom and practical exercise sessions and shall provide the student with the basic knowledge necessary to utilize all training materials. The Contractor shall provide a detailed schedule outlining the length and content of each of these sessions in accordance with the guidelines established.

e The training program shall include familiarization with equipment operation and performance and detailed instruction in operation, configuration, troubleshooting, maintenance (preventive and corrective), repair (field and bench), and test procedures.

4. System Administration Training

a The number of System Administrators selected by the Airports Authority shall be trained in system administration and software. Formal training of the software personnel shall commence in the two (2) weeks immediately before activation of the new PARCS equipment.

b Training shall provide detailed instruction covering all systems, software, applications, and support programs for the Airports Authority. These courses shall include a functional overview of the complete software system and “hands-on” configuration and operating parameter modification. The course material shall be presented in depth with the instructor covering detailed software and database design and structure.

5. CDMS User Training

a Personnel who shall use the CDMS shall be trained in the use of all application programs and functions provided by the system. The Contractor shall structure this training as a series of logically arranged topics so that individual users may attend only those portions of the course that are of interest. This training shall at minimum include:

i PARCS device management functions.
ii PARCS device configuration functions.
iii PARCS device status monitor functions.
iv Generation of all standard reports.
v Bankcard authorization operations and configuration.
vi Interfaces with other Airports Authority systems.

6. CDMS Administration Training

a Airports Authority personnel who shall be responsible for administration and systems maintenance shall be trained in all aspects of CDMS administration, to ensure optimal performance as well as correcting system problems. This course shall provide the personnel with the fundamentals to perform all CDMS administrative functions, including but not limited to:

i Backup and restore.
ii Disaster Recovery.
iii User login administration.
iv Anti-virus definition updates.
v Load balancing.
vi Networking configurations.
vii Interfaces with other agency computer systems.
viii Bankcard clearing house interfaces.
ix Report and Query Customization – including use of the Report Writer tool.

7. Accounting and Auditing Staff Training

a The number of Accounting and Audit Staff selected by the Airports Authority shall be trained in system operations, shift and daily revenue reconciliation, resolution of bankcard payment exceptions, customer service, administration, and PARCS software features. Training of the office staff/accounting personnel shall commence in the two (2) weeks immediately before activation of the new PARCS equipment

b Report Training – Those management personnel who shall generate and use revenue and usage reports from the CDMS shall receive specialized training to be familiar with revenue and usage report contents and uses and learn how to use the reporting tools generate and customize reports. Using sample data created from testing intervals or other sources, reports shall be generated from the CDMS and used to explain the resulting data output.

c Data Queries – Training shall be provided to instruct staff on performing data queries in the PARCS.

Y Training Summary

1. At a minimum, the training schedule shall provide separate curriculum for the seven (7) classifications of personnel outlined in Table 4.

Table 4: List of Training Courses and Estimated Participants

Course	Estimated Participants	Sessions	Train the Trainer
Cashiers	40	10	✓
Supervisors	12	5	✓
Maintenance Technicians	10	2	✓
System Administrators	4	2	
Accounting and Auditing Staff	10	2	✓

20.6 Installation

This sub-section identifies the following installation subsections: Installation Services, Installation Phasing, Installation Procedures, Removal of Existing Equipment, CDMS Installation, PARCS Test Bed Installation, PARCS Equipment Installation, Parking Office Equipment Installation, Parking Office Equipment, Cashier Station Equipment, and Physical Installation Requirements. Documentation with regard to manuals, drawings, instructions, and other documents are identified.

A Installation Services

1. All installations shall be completed by workers who are experienced in installing computer hardware, software, and computerized parking control equipment components.
2. The PARCS shall be installed by technicians trained for their specific tasks with no less than two (2) years hands-on PARCS hardware and

software experience at Airports. The Contractor shall provide the Airports Authority with appropriate documentation demonstrating that experienced, licensed and certified technicians are performing the installation within ninety (90) days of the installation phase. CDRL 174

3. The Airports Authority may have other construction projects in progress that may affect facilities or infrastructure relevant to the PARCS project. The Contractor and the Airports Authority shall work together to schedule work that expedites the PARCS project in conjunction with any other projects at the Dulles Airport.
4. As part of the PDR, the Contractor shall submit to the Airports Authority for review and approval an Installation and Cutover Plan. The plan shall indicate the method of installation and connections, the installation schedule, and any support required from the Airports Authority for all installation activities.

B Installation Phasing

1. The Contractor shall verify that the installation sites are ready for equipment installation. Any discrepancies between actual conditions and design conditions shall be brought to the attention of the Airports Authority. Installation shall not proceed until all significant discrepancies have been resolved.
2. At least ninety (90) days prior to the start of installation, the Contractor shall meet with the Airports Authority to discuss the installation program and identify key events.
3. The Contractor's installation schedule shall ensure the availability of a maximum number of operable lanes to meet peak period activity.
4. The Contractor shall inspect and verify construction site cleanup at the completion of all construction activities. The Contractor shall notify the Airports Authority at least forty-eight (48) hours prior conducting post-construction inspections.

C Installation Procedures

1. Not less than sixty (60) days prior to delivery of the first PARCS equipment or the preparation of any site by the Contractor for PARCS installation, the Contractor shall submit for the Airports Authority's review and approval drawings of the equipment installation, indicating details on all equipment installation, location, orientation, and electrical and communications connections. CDRL 175

D Removal of Existing Equipment

1. The Contractor shall be responsible for removal of all PARCS hardware equipment replaced or abandoned due to the implementation of the systems detailed in this contract. The Contractor shall not remove any PARCS equipment without prior approval from the Airports Authority.
2. The Airports Authority shall be responsible for removal and disposal of any booths.
3. The Contractor shall remove all Booth Transaction Panels from cashier booths that remain, while retaining the intercom components for reuse outside of each booth located by the proximity card readers.
4. The Airports Authority shall be responsible for moving and storing the equipment components that have been removed by the Contractor.

The Contractor shall inform the Airports Authority at least twenty-four (24) hours in advance of removing any equipment and upon condition of approval from the Airports Authority. All removed equipment shall be the property of the Airports Authority.

E CDMS Installation

1. Prior to installing any PARCS field equipment, the Contractor shall install and make operational the CDMS, including all interfaces with external systems and the separate CDMS at the Disaster Recovery Site. The Contractor shall install the components of the CDMS at the locations and in the manner as described below. All installation effort shall be at the direction of the CO. The Contractor shall not initiate any CDMS installation activities without the written approval of the Airports Authority.
2. All CDMS servers shall be installed no later than thirty (30) days following the Airports Authority's acceptance of the FAT results at location(s) to be identified by the CO during the design review phase. Suitable power source of 120 VAC, 60 Hz shall be available within ten (10) feet of the CDMS. If the appropriate power requirements are not available at either of the Data Centers, the Contractor shall provide the Airports Authority's continuing contractor with the necessary power specifications to support all installed hardware. Environmental control requirements shall be provided by the Contractor and if necessary, the Airports Authority shall be responsible for providing those environmental controls at either location.
3. For each CDMS (Production and Disaster Recovery Site), the Contractor shall furnish and install a standard sized cabinet into which the Contractor shall install all CDMS hardware. All CDMS servers shall be mounted on sliding rails to facilitate easy access. Indoor equipment shall be installed in EIA 19" cabinets; the CDMS equipment shall be installed in EIA 19" or EIA 23" cabinets. All cabinets shall include locking doors to prevent unauthorized tampering with electronics. The Contractor shall ensure that all cabinets include padlocks.
4. For each CDMS (Production and Disaster Recovery Site), the Contractor shall supply and install a KVM (Keyboard, Video, Mouse) switch and connect all corresponding cables to each CDMS server.
5. For each CDMS (Production and Disaster Recovery Site), the Contractor shall supply and install a monitor (19" minimum diagonal measure), keyboard, and mouse (or other suitable pointing device) into the rack and connect all corresponding cables to the KVM switch should the CDMS be hosted on-site
6. The Contractor shall submit drawings or other suitable design information for the CDMS rack, power distribution design, cabling plan, KVM switch, monitor, keyboard, and pointing device for CO review and approval at the FDR.

F PARCS Test Bed Installation

1. In conjunction with CDMS installation, and if not already installed for FAT, the Contractor shall install all equipment designated for the PARCS test bed. Upon installation, the Contractor shall configure and test all equipment in the facility, and verify that communications with the CDMS are functional. The PARCS test bed shall undergo CDMS

Operational testing and Bankcard System Certification testing, post-installation inspection, post-installation field test, and lane testing as defined in the Post-Installation Services section.

G PARCS Equipment Installation

1. Upon successful installation and testing of the test CDMS and test bed, the Contractor shall commence PARCS equipment installation.
2. The Contractor shall coordinate lane closures with the Airports Authority. All lane closures shall be approved by the Airports Authority in advance of the closure.
3. The Contractor shall install all equipment described in strict accordance with the manufacturer's recommendations, the contract, the approved Installation and Cutover Plan and all applicable local Codes and Standards.
4. The Contractor shall coordinate with the Airports Authority's continuing contractor, all necessary site preparation, island construction and/or modifications necessary to support equipment installation, and all other site preparation work necessary to complete the installation.
5. The Contractor shall immediately inform the Airports Authority should any need arise to depart from the approved installation specifications. No deviation from installation specifications or the approved Installation and Cutover Plan shall occur without prior written approval from the Airports Authority.

H Parking Office Equipment

1. At least fifteen (15) days prior to the first lane equipment installation the Contractor shall install and configure PARCS computer workstations, Discount Production Units, and printers in locations designated by the Airports Authority.
2. The Contractor shall confirm that all parking office equipment functions properly, communicates with the PARCS networks, and all software applications are fully installed and operational.
3. Cashier Station Equipment
   - a During the design phase of the project, the Contractor shall submit a layout of the Cashier Station equipment placement within the existing cashier booths for the Airports Authority's approval at the PDR CDRL 176. All Cashier Station equipment shall fit within the existing booths and provide safe, ergonomic operation that shall minimize operator fatigue and repetitive stress injuries. The cashier shall not be required to reach within a component or below the booth counter to retrieve processed tickets.
   - b The Contractor shall install all Cashier Station equipment and make any modifications necessary to accommodate the equipment. All modifications to Cashier Stations shall adhere to the design plan or require prior written approval from the Airports Authority.

I Physical Installation Requirements

1. Equipment Mounting requirements include the following:

a The Contractor shall install all PARCS equipment to ensure proper operation and functionality while operating in the environmental conditions as identified in Section 4**Error! Reference source not found.**.

b All equipment shall be mounted in cabinets. For outdoor application, cabinets designed to protect equipment from rain, dust, and other potential environmental impediments shall be utilized.

c PARCS external equipment mounting shall be in a secure, robust, manner that resists vandalism, and can withstand the environmental conditions, especially wind load and all other conditions as identified in Section 4. Each equipment cabinet mounted to the pavement shall be by means of at least four (4) stainless steel anchor bolts, no less than 0.5 inches in diameter, to be provided by the Contractor. The Contractor shall submit the method of anchoring the PARCS equipment mounting bolts into the concrete for CO review and approval at the PDR.

d Any equipment with top access (as opposed to front access) shall be mounted on lockable drawer slides. No equipment shall be installed in a cabinet where it interferes with access to other equipment nor closing and locking of its or other equipment cabinet doors.

e Cables shall be neatly dressed in equipment cabinets so that they do not interfere with other equipment.

f No equipment module shall be laid on top of other equipment in a cabinet inhibiting the removal of the bottom unit. EIA bonding and grounding standards shall apply for all metallic communications circuits. Surge and lightning protection, related to metallic communications interfaces, shall be designed by the Contractor and installed by the Airports Authority's continuing contractor unless equipment is hosted off-site. Power grounding and distribution shall comply with NEC, IEEE Standards for Powering and Grounding Sensitive Electronic Equipment, and for providing emergency power to industrial equipment.

g Where dissimilar metals abut, the appropriate corrosion controls shall be included.

h All PARCS equipment (e.g. cabinets, gates, etc.) shall use Barrel Locks or equivalent.

2. Markings

a All cables shall be permanently marked on both terminating ends with a unique identification number that corresponds to Record Document drawings provided by the Contractor in accordance with EIA/TIA 606 standard. Markings shall be permanent and in a font determined in design and approved by the Airports Authority. Marking shall not deteriorate with age, exposure to light, or by handling by maintenance personnel. The markings on the cable shall uniquely identify the cable's function, length and interconnections.

b Each connector shall have a unique identification. The identification may be by cabinet and drawer as well as connector number providing a unique cable identification. Cable drawings

shall refer to unique connector identification for interface. It shall be very clear to a technician which cabinet, electronic drawer and associated connector that a cable is connected.

c All switches and indicators shall be identified as to function. Each terminal block shall have a unique identification and each terminal clearly numbered. An interconnect diagram shall reference terminal block number as well as terminal number for interconnects. CDRL 177

d All power interconnects shall include the power requirements and maximum current load. Equipment shall be selected with resettable circuit breakers rather than fuses. An indicator shall be utilized to show power status of equipment.

e All power terminals transferring voltage over twenty-four (24) volts and current over one (1) amp shall be protected from inadvertent contact by a technician. The cover shall include a warning against electrical shock. No equipment shall be supplied that does not meet NEC requirements for electromagnetic and radio frequency compatibility.

3. Finishing Requirements

a For PARCS equipment bolted to pavement, the interface between the base of the PARCS field equipment and the concrete surface shall be sealed with a material approved by the CO at the PDR. The sealant shall perform as a durable, attractive, watertight seal and shall be resistant to abrasion, weather, staining, and migration. The sealant shall not deteriorate in any manner except as indicated in manufacturer's data. The Contractor shall install the sealant in compliance with the manufacturer's requirements and recommendations.

4. In the PDR, the Contractor shall provide a submittal for Airports Authority review on the sealant, including its color, performance specifications and physical characteristics. If applied to indoor surfaces, the sealant shall be a low Volatile Organic Compound (VOC). CDRL 178

20.7 **Documentation**

A Manuals are a critical component of the PARCS project, and the Contractor shall provide all manuals as specified herein. Manuals provided shall be written in clear and concise English and shall assume the reader has sufficient education and technical experience to understand and to perform the job function for which the manual is required. Care shall be taken to provide easily understood directions and explanations and step-by-step instructions with cross-references to all drawings, diagrams, and photos, with no extraneous material such as advertisements.

B All manuals shall be supplied in hardcopy and electronic form. Electronic file formats shall be compatible with MS Office® products. Provided media shall not be copy protected or encrypted in any way.

C Electronic forms of the manuals shall make use of hyperlinks from the Table of Contents, Index, and other internal cross-references to referenced points in the manual and to external sources of additional information, such as OEM web pages.

D The content and organization of all manuals shall be coordinated with training, special tools, and test and diagnostic equipment. Together, the manuals and other support services and materials shall constitute a uniform approach in addressing the level of repair and maintenance required to support the PARCS. The supported level of repair shall include basic preventive maintenance, field repair and replacement, routine bench repairs and overhauls, and modest levels of circuit board and subcomponent repairs that can be sustained by the Airports Authority's existing maintenance technicians.

E These manuals shall be used in the training program and their development and evolution shall be in conjunction with the training materials outlined in this Technical Specification.

F For the repair and maintenance support of third party standard products, the Contractor shall supply manuals, special tools, test and diagnostic equipment commercially available from the product manufacturer and to the extent reasonable and possible, consistent with the overall PARCS maintenance and level of repair.

G The Contractor shall submit manuals in progressive steps as follows:

1. The general outline of manual contents shall be submitted for review and approval as part of the PDR.
2. Final drafts of the manuals shall be submitted for review and approval as part of the FDR.
3. All copies of complete manuals (hard copy and electronic media) in final form at system acceptance.
4. Updates to all manuals, reflecting changes incorporated during the warranty period, shall be submitted upon completion of the warranty period.

H General Requirements for Manuals – all manuals supplied as part of this contract shall meet the following general conditions:

1. For every item of equipment furnished by the Contractor, the Contractor shall furnish operating manuals giving complete instructions relative to assembly, installation, operation, adjustment, lubrication, maintenance, and complete parts list. If needed maintenance and repair information is required, manuals from OEM suppliers shall also be provided.
2. Manuals furnished may be the Contractor's standard publications concerning size and binding provided they comply with specified requirements relative to quantity and quality of information and data, and upon approval.
3. Manuals shall be bound in hard or flexible covers.
4. Illustrations shall be clear, and printed matter, including dimensions and lettering on drawings, shall be easily legible. If reduced drawings are incorporated into manuals, original lines and letters shall be emboldened as necessary to retain their legibility after reduction. Larger drawings may be folded into manuals to page size. Any reproduction shall be of near-perfect quality. No blotched or poorly readable areas on any reproduction are allowed.
5. All manuals shall use nomenclature, symbols and designations common to those found and approved by such bodies as the IEEE,

which are common to the United States work place. References to supplemental information shall be included where necessary.

6. The Contractor shall identify all information judged to be of a sensitive nature by the Airports Authority or the Contractor no later than the FDR and shall be handled in a manner to be determined by the Airports Authority.
7. Manuals shall be designed for continuous, long-term service in a maintenance shop environment.
8. Manuals shall lie flat when opened and shall permit adding and replacing pages. Contents shall be divided by section.
9. Manuals shall be identified on both the front and spine of each binder.
10. Margins shall be of sufficient size so that all printing avoids punched holes.
11. Manual pages shall be nominally 8½ inches by 11 inches (excluding Quick Reference Guides, which shall be pocket-sized foldouts or soft-cover bound).
12. Manuals shall not exceed three (3) inches in thickness. If necessary, manuals shall be split into multiple volumes to keep binder size at most three (3) inches.

I Manual Format

1. The general content and sequence shall satisfy the following requirements:
   - a Title Page: include the name and function of the equipment, manufacturer's identification number, and the Project Specifications number and title.
   - b Table of Contents: in number order listing each section and subsection title of the manual with reference to the page on which each starts and a list of included diagrams and drawings.
   - c Frontispiece: recognition illustration of the equipment described in the manual.
   - d A description of each piece of equipment, including major assemblies and subassemblies, and giving manufacturer's model numbers and drawing numbers. Manuals shall treat each item of equipment as a single integrated system of components, subassemblies, and accessories designed to work together, and shall not be merely a collection of disassociated sections from various suppliers. The Contractor shall ensure that all its suppliers' efforts are compatible and that interfaces among various subsystems are represented in sufficient detail to provide a clear and complete functional description of the PARCS. In general, manuals shall be logically organized with systems and elements considered in descending order of importance.
   - e Operational instructions including systematic preparation for start-up, initialization, operation, shutdown, and identifying all hazards (such as sharp edges and high voltages).
   - f Control diagrams as installed by the manufacturer.
   - g Sequence of operation by the control manufacturer.
   - h Wiring diagrams, as installed.

i Diagrammatic location, function and tag numbers of each component.

j Maintenance instructions: include systematic procedures for inspection, operation checks, cleaning, lubrication, adjustments, repair, overhaul, disassembly, and reassembly of the equipment for proper operation of the equipment. Include list of special tools that are required for maintenance with the maintenance information.

k Possible breakdowns and repairs. Troubleshooting flow charts and/or symptom-action tables shall be included for diagnosis of any major system or control.

l Manufacturer's parts list of functional components, control diagrams and wiring diagrams, giving manufacturer's model number and manufacturer's part number.

m "Long-Lead-Time" spare parts list for spare parts not readily available on the open market or for which it is anticipated ordering and delivery time exceeds ten (10) days.

n List of nearest local suppliers of all equipment parts.

o Recommended preventive maintenance schedule for major system components.

p Manufacturer's warranty and guarantee data.

q Spare parts data including complete list of parts and supplies, with current unit prices and sources of supply.

r All equipment or tools required for the general up-keep, maintenance and overhaul of the equipment or product. Suggested suppliers for all specialty tools shall be shown.

s Index, in alphabetical order.

t Appendices: include safety precautions and procedures, a glossary, and, if available at time of submittal, copies of test reports, and other relevant material not specified to be submitted.

2. The Contractor may provide manuals with differing formats than specified below, but shall identify these as part of the PDR submittals.

J Wiring Diagrams - where provided, wiring diagrams shall conform to the following:

1. Electrical wiring diagrams and other diagrams necessary for operation of the equipment shall be provided for all PARCS equipment.
2. No single diagram shall show more than one (1) system, or parts thereof.
3. Diagrams shall be reproduced by Xerographic process to a size not to exceed eighteen (18) inches by twenty-four (24) inches and shall be complete and legible in all respects.

K Content of Manuals - shall be organized and shall include, as a minimum, the information as follows. If all information required herein is supplied, alternative manual breakdowns and structures shall be permitted, subject to CO approval. The Contractor may provide manuals with differing formats and content than specified below, but shall identify these as part of the PDR submittals. PARCS Field Equipment – for each Contractor provided device installed or used as part of the PARCS, the Contractor shall supply the following manuals (as applicable):

1. Operating Instruction Manual – shall contain all information needed for safe, proper, and efficient operation of the PARCS device. Manuals shall include general orientation and familiarization with all features of the device. Detailed information shall be provided regarding location, function and operation of all controls, indicators, switches, hardware and reset buttons, and trouble diagnosis. All normal operational sequences shall be described in detail. CDRL 179
2. Preventative Maintenance Manual – shall contain all information needed to enable maintenance technicians to perform all periodic inspection and preventative maintenance tasks including all routine lubrication, inspection and replacement of consumable items. The manual shall contain recommended preventative maintenance schedules grouped, as much as possible, into compatible and convenient intervals of time, or operating hours. CDRL 180 If binder size limitations permit, this manual may be combined with the Corrective Maintenance Manual.
3. Corrective Maintenance Manual – shall contain all information needed to enable maintenance technicians to diagnose problems, and to make adjustments, replacements, and repairs to all field-repairable and field-replaceable modules, components, and subassemblies. Repairs include adjustments, repairs or replacements prescribed to restore the device components and subassemblies to a normal operational condition in an efficient and timely manner. CDRL 181 The manual shall include, at a minimum, the following:
   - a A general description of each subsystem, component and subassembly
   - b Procedures to exchange all major components
   - c Functional block diagrams
   - d Detailed schematics
   - e Wiring diagrams
   - f Pictorials with exploded views to permit easy parts identification
4. Shop Repair and Overhaul Manual – shall contain a detailed description of each assembly and subassembly to enable maintenance technicians to service, inspect, troubleshoot, maintain, repair, replace, rebuild, and overhaul the device, and shall provide all information needed for in-shop repair and trouble diagnosis of the LLRU. CDRL182 The manual shall include, at a minimum, the following:
   - a Complete systematic procedures
   - b Wear and tolerance limits for determining when overhauls are needed
   - c Overhaul procedures for all major components
   - d Special tools and equipment required
   - e Pictorials with exploded views to permit easy parts identification
5. If binder size limitations permit, this manual may be combined with the Parts Manual.
6. Parts Manual – shall enumerate and describe every component with its related parts, including the supplier's number, the Contractor's number, and provision for entry of the Airports Authority store's number. Cutaway and exploded view drawings shall be used to

permit identification of all parts not readily identified by description. Parts common to different components, such as screws, shall bear the same Contractor's number with reference to the other components where they are found. Each part or component shall be identified as being part of the next assembly. Commercially available items such as standard fasteners, fuses, lamps, fittings, switches, solenoids, and motors shall be identified by standard hardware nomenclature in addition to the Contractor's number. CDRL 183

7. Software and Programming Manual – shall describe how to install, operate, configure, and maintain the device software. Procedures for updating device application software (for when the CDMS is not available) shall be provided. The manual shall also include a high-level description of the device application software design and the function of all executable modules. CDRL 184
8. Software Data File Manual – one or more manuals shall also be provided (separately if necessary) that fully documents the device application data files, data file structure, and data file mapping and cross-referencing. CDRL 184
9. Field Maintenance Quick Reference Guide – this manual shall be a pocket-sized guide tailored to assist field maintenance personnel in conducting common activities and the service commands used to perform them. CDRL 186

L CDMS Manuals – for each element of the CDMS, a comprehensive set of manuals shall document the system, networking interfaces, software design, database structures, and so on. These documents shall be provided by the Contractor for review at the PDR and approval at the FDR by the Airports Authority. These manuals are summarized as follows:

1. CDMS OEM Manuals – shall be provided unaltered. All manufacturers' hardware and software documentation for the computer system, workstations, and any associated networking hardware and software shall be supplied in their entirety. Where appropriate, these manuals may be bound with the Contractor's documentation. CDRL 187
2. CDMS Administrator's Manual – shall supply all necessary procedures to administer the computer system and the associated networking hardware and software. Administrative requirements of the computer system's operating system software shall be described in detail or specific references to the manufacturer's operating system documentation shall be supplied. All administrative procedures, including managing user accounts, data archiving, and backup creation and restoration (full and incremental) shall be provided in this documentation. All functions performed only on Administrative Workstations (i.e., the computer system monitor and keyboard) shall also be documented in this manual. CDRL 188
3. CDMS User Manuals – shall provide complete documentation on the use of the associated CDMS user functions. All user functions and procedures shall be fully explained, including logging onto the system, querying the database, generating reports, altering parking fee tables and other operating parameters, downloading data, polling devices for data, and other features unique to any computer system, and proper responses to all input requests. The manuals shall make extensive

use of sample screen images. The CDMS User Manuals can encompass all user manuals related to the operation of the PARCS CDMS. CDRL 189

4. CDMS Report Formatting Manual – shall provide instructions on how to create new queries and reports and to modify existing reports. Instructions on how to add reports to the list of prepared reports, to schedule reports for automated generation at predetermined times, and to delete unused reports shall also be provided. If necessary, specific references to manufacturer's documentation shall also be provided to clarify instructions. If binder size limitations permit, this manual may be combined with the CDMS Database Structure Manual. CDRL 190
5. Database Structure Manual – shall provide a complete description of the database structure, including definitions, parameters, and relations for all database fields, records, and tables, and shall incorporate the ERD for the as-built database. CDRL 191
6. CDMS Network Architecture – shall describe the design of the CDMS network architecture and the communications interfaces used between the computer system, its dependent components (such as field devices) and external interfaces (such as the bankcard clearing house, interfaces and the Airports Authority's legacy data systems). CDRL 192
7. CDMS External Interface Manual – shall describe the file format, communication protocols, and other aspects of an API employed to exchange information between the CDMS and all external sources, excluding the bankcard-clearing house. CDRL 193
8. Bankcard Clearing House Interface Manual – shall describe the communication protocols and data formats for the interface between the CDMS and the Airports Authority's bankcard clearing house. This document shall be delivered separately to the CO, and shall be developed under strict compliance with the PCI DSS. CDRL 194
9. Special Tools and Equipment Manual – all special tools and test equipment shall be accompanied with operation and maintenance manuals to the same level of detail as that supplied for the PARCS equipment. The manuals shall permit the Airports Authority to operate, maintain, and repair all test equipment without assistance from the Contractor. CDRL 195

M Revisions

1. Revisions to draft and approved manuals shall be recorded on a control list in the front of each manual. The list shall be issued with each revision and shall show the date of each revision and the page reference. The Contractor shall maintain updated lists and revisions in the manuals until the warranty period expire. Revisions shall be prepared before the arrival of altered components and immediately after procedures are changed or errors are found.
2. Manuals shall be numbered, and revisions to the manuals shall be issued according to manual number. Updating of lists and manuals shall be performed on a not-less-than quarterly basis during the first twelve (12) months after the manuals are delivered and then on a not-less-than semi-annual basis for the duration of the warranty period.

3. Revisions related to alterations of subsystems or assemblies shall be issued before the arrival of components or retrofit packages.
4. For each revised manual, the Contractor shall submit hardcopies (in quantities equal to the number of hardcopy manuals delivered) of the altered and new pages to be inserted into the manuals. In addition, for each revised manual, the Contractor shall supply new electronic media, clearly labeled to indicate its revision number and date.

N Quantities of Manuals - The Contractor shall provide one (1) high-quality reproducible master, one (1) electronic copy, and the following hard copy quantities of each of the manuals.

Table 5: Quantities of Manuals to be Supplied

Manual	Quantity
Operating Instruction Manual (per PARCS device)	5
Preventive Maintenance Manual (per PARCS device)	5
Corrective Maintenance Manual (per PARCS device)	5
Shop Repair and Overhaul Manual (per PARCS device)	5
Parts Manual (per PARCS device)	2
Software and Programming Manual (per PARCS device)	2
Software Source Code Manual (per PARCS device)	1
Field Maintenance Quick Reference Guide (per PARCS device)	15
CDMS OEM Manuals	As Supplied
CDMS Administrator’s Manual	3
CDMS User’s Manual	10
CDMS Report Formatting Manual	3
CDMS Network Architecture Design Manual	3
CDMS Database Structure Manual	3
CDMS External Interface Manual	3
Bankcard Clearing House Interface Manual	1
CDMS Software Source Code Manual	1
Special Tools and Equipment Manuals	5 each

O Reproducible Drawings

1. Time and Scope of Submittals
   a Within thirty (30) days following System Acceptance of the equipment, the Contractor shall supply quality reproducible drawings of all fabrication assemblies, subassemblies, circuit diagrams and arrangements of the PARCS equipment, as finally furnished, accepted and modified CDRL 196. Included shall be reproducible drawings of all material furnished to the Contractor by its suppliers down to and including the module and circuit board level and parts used on those modules and boards. In both cases, outline drawings shall include a complete and specific reference to all other drawings that represent the next

higher order of assembly. Drawings shall be sufficient to execute all manner of maintenance, replacement, repair, overhaul and rebuild, but not manufacture. Additionally, final documents for all information technology layers (server, network, storage, datacenter, database, application, service, UX and integration) shall be submitted.

b The Contractor shall supply quality reproducible originals for the following items:

i All Contractor's and suppliers' drawings, details, bills of material, and catalog cuts that are required by the Airports Authority for future installation, maintenance and repair purposes

ii All assemblies, subassemblies, and arrangements of the equipment

iii All items which are special purpose or fabricated by the Contractor

iv All materials furnished by the Contractor and by its suppliers, down to and including the module and circuit board level.

2. As-Built Drawing Requirements

a The Contractor shall submit for each set of as-built drawings the following:

i One (1) copy of all drawings on electronic media, in a format approved by the CO. Electronic copies of as-built drawings prepared for this contract shall be submitted to the CO as digital, CADD files created in, or formatted in such a way to be directly converted into the most recent AutoCAD file format (.dwg) which the Airports Authority supports. Drawing format to be identified by the CO within ninety (90) days after NTP.

ii One reproducible CADD-generated hardcopy. All hard copies shall be no larger than standard "D" size drawings.

b All drawings germane to the subject shall be submitted as a package, with index, cover sheet, and symbols and abbreviations table. All nomenclature and labels shall correspond to actual labels on installed equipment. Each connection to each piece of equipment, junction box or terminal block shall be identified by function and color code. All dimensions, physical details, connections, and other information pertinent to system diagnostics, maintenance and troubleshooting shall be shown.

c Drawing Format and Content – submitted drawings shall satisfy the following requirements:

i Language on the drawings shall be in English.

ii The Contractor shall not alter approved drawing formats through the course of the project.

iii Fifteen (15) sets of drawings (8 of size "E" and 7 of half size of "E") related to the outer dimensions of the exit and entry barriers, including the main components shall be prepared in English.

iv Any drawings required for use by subcontractors other than the Contractor's subsidiaries (e.g., installation, maintenance, etc.) shall be provided in English.

d Master Drawing Index - a master index of drawings shall be submitted that clearly indicates the organization of the as-built drawings, listed by drawing number. The master drawing index shall also provide cross-references to related drawings, and shall indicate the hierarchy of all drawings and drawing layers.

e Revisions to be included - The electronic and hard copies shall include all revisions made during construction and be in as-built configuration.

21 CONTRACTOR'S QUALITY ASSURANCE PROGRAM

This section identifies requirements related to Project Quality Management including processes and activities that determine quality policies, objectives, and responsibilities so the project will satisfy the needs for which it is being undertaken.

21.1 Project Quality Management

QA and QC measures will be taken by the Contractor to ensure the quality and integrity of the system and meets requirements of this procurement. The QA/QC plan implements a quality management system through policy and procedures with continuous process improvement activities conducted throughout the life of the project, as appropriate. QA is the process of auditing/checking the quality requirements and the results from quality control measurements to ensure appropriate quality standards. QC is the process of monitoring and recording results of executing the quality activities to assess performance and recommend necessary changes.

A The Contractor shall plan, establish, and maintain a Quality Assurance (QA) Program Plan. The Contractor's QA Program Plan shall be imposed upon all entities within the Contractor's organization and on all sub-contractors whenever contract work is performed.

B The Contractor shall prepare and submit for approval a QA Program Plan that addresses control of the quality of the Contractor's design, equipment furnished, testing, training, and documentation. .

C A QA Program Plan shall be submitted to the CO for approval within sixty (60) days after NTP for Airports Authority review and approval. CDRL 197 The Contractor shall use and abide by the approved QA Program Plan to execute the scope of work. The QA Program Plan shall describe the methods for planning, implementing, and maintaining quality, schedules, and cost. The QA Program Plan shall contain a company policy statement that clearly defines the responsibilities of QA personnel. An organization chart shall be included to show the reporting relationships of all QA staff, and shall indicate the Contractor's QA/QC representative.

D The QA Program Plan shall also contain a collection of all forms to be used for the documentation of quality control activities, which assure compliance of materials, processes, personnel, and products to the applicable specifications.

E The QA Program Plan shall at minimum include procedures for the following activities:

1. Factory inspection and test procedures and records.
2. Configuration Management Program, procedures, and records for Change Control and version management.
3. Procedures and records for equipment handling; inventory; storage; delivery; design control; changes to documents, drawings, data, and Specifications; release for shipment; shipping; evidence of

compliance; corrective action; calibration/verification of measuring equipment and audit.

4. Software Development Quality Assurance Program, consistent with that indicated in IEEE Standard 730, IEEE Standard for Software Quality Assurance Plans or equivalent ISO 9001 standards for software quality assurance.
5. QA program requirements for subcontractors.
6. System test procedures and records.
7. Surveillance over all work, including subcontractors, for conformance and verification thereof with all contract requirements.
8. Discrepancy control.
9. Feedback of problems, their resolutions to the Contractor’s engineering and production departments, and corrective action.

F Airports Authority Quality Assurance - The CO may, at its discretion, perform its own QA monitoring of work done under this contract, including monitoring of the Contractor or sub-contractor’s QA activities. Such activities shall not reduce or alter the Contractor’s QA responsibilities, nor reduce or alter the Contractor’s obligation to meet the requirements of this document.

G After NTP, the CO or his designee shall have the right of free access to facilities of the Contractor and sub-contractors. This right shall permit the CO to inspect, examine, and test items during manufacture and prior to shipment. On demand, the Contractor’s QA Plan, procedures, and records shall be made available to the CO for inspection and audit. In addition, copies of all drawings, diagrams, schedules, changes, and deviations shall be made available promptly upon request.

H If so requested, the Contractor shall provide to the CO a temperature-controlled and adequately lighted private office at the Contractor’s manufacturing facility to accommodate a minimum of two (2) people. A telephone and Internet connection shall be made available and shall be dedicated to the CO’s use only.

I At any time during the manufacturing process, subject to a minimum of five (5) days prior notice, the Authority may choose to schedule a visit to the Contractor's facility or a Subcontractor's facility during normal working hours to audit the manufacturing and quality control processes.

J Appropriate QC activities, including measurements, shall be used to analyze and evaluate all quality standards and processes.

22 WARRANTY SERVICES

This section defines requirements related to warranty coverage and response times for the first year.

22.1 General

A The contractor hereby warrants to the Authority that all equipment, computer systems and software, including firmware as warranted by third party suppliers, furnished under this contract shall be free from defects in material and workmanship under normal operating use and service.

B The Contractor shall maintain all systems that are in operation prior to starting the warranty period. This includes all preventative maintenance and repairs.

C The Contractor shall maintain all systems throughout the warranty period. This includes all preventative maintenance and repairs except for Operational Level preventative maintenance and repairs provided by the Airports Authority.

D All Contractor-supplied PARCS hardware and software shall be warrantied during both equipment installation and also for a one (1) year post-system acceptance warranty period.

E No warranty period shall end until finished documentation and deliverables are provided by the Contractor and approved by the Airports Authority.

F The Contractor shall warranty all parts, materials, and workmanship following Final System Acceptance for a period of twelve (12) months. All inclusive costs (parts, labor, maintenance, warranty repairs, shipping charges, Contractor travel time, Contractor expenses, etc.) incurred during the warranty period shall be provided without additional cost to the Airports Authority.

G The Contractor warrants all systems/subsystems to comply with Section 24 PARCS Performance Standards.

H The Contractor hereby warrants to the Airports Authority that all of the equipment, computer systems and software, including firmware as warranted by third party suppliers, furnished under this contract shall be free from defects in material and workmanship under normal operating use and service where provable misuse, abuse, vandalism, or negligence by Airports Authority employees or the using public or damages due to Acts of God are not considered normal operating use.

I Costs (time and material) for repair or parts replacement, components, etc., damaged or rendered unserviceable due to apparent and provable misuse, abuse, vandalism or negligence by Airports Authority or the using public are excluded as a warranty item. Also excluded from the warranty are damages due to Acts of God.

J The Contractor shall develop a Warranty Plan outlining the processes and procedures to be implemented to meet the requirements set forth herein for warranty services. A draft version of the Warranty Plan shall be submitted

at the FDR and a revised final version shall be provided a minimum of ninety (90) days prior to the first delivery of PARCS equipment. CDRL 198

K Throughout the Warranty period the Contractor shall be commpliant with PCI, ADA, and EMV standards referenced in section 4.5.C.

22.2 PARCS Maintenance

A PARCS Maintenance is defined as follows:

1. Software support
2. Hardware preventative maintenance
   a Operational Level - Preventative cleaning and field adjustments.
   b Technical Level – All other preventative maintenance tasks.
3. Hardware Repairs
   a Operational Level – clear jams, load ticket/receipt stock, reset device.
   b Technical Level 1 - Troubleshooting, field repair, removal and replacement of defective parts, returning the PARCS equipment to successful revenue service.
   c Technical level 2 - Shop repair, printed circuit board and component level repair, module adjustments.

B During the Warranty period the Contractor shall provide maintenance in the following areas:

1. Software support
2. Technical Level hardware preventative maintenance
3. Technical Level 1 and Level 2 hardware repairs

C During the Warranty period the Airports Authority shall provide maintenance in the following areas:

1. Operational Level hardware preventative maintenance
2. Operational Level hardware repairs

D A draft of the Warranty Repair Agreement shall be submitted at the FDR and a revised final version shall be provided a minimum of ninety (90) days prior to the first delivery of PARCS equipment. CDRL 199

E The Contractor shall submit for the Airports Authority's approval the preventative maintenance schedule thirty (30) days prior to the first lane installation. CDRL 200

F The Contractor shall submit the documentation used to record the preventative maintenance performed for each device thirty (30) days prior to the first lane installation.

G The Contractor shall be responsible for all costs associated with the repair of components and/or subsystems, and the shipping charges to and from the Contractor's repair facilities, and the costs associated with their re-installation under the Warranty Repair Agreement.

H The Contractor shall perform all remedial work to correct any actual and reported deficiencies, which shall include the repair or replacement, at the Contractor's option, of equipment, components, devices, and materials, and the reprogram and update of software with any necessary personnel, tools and materials at the Contractor's own expense.

I The Contractor shall be responsible for meeting with the Airports Authority to determine the schedule of repairs.

J Access to Equipment in Revenue Service – The Contractor shall follow the proper Airports Authority procedures for gaining access to the PARCS equipment in the field. The Contractor shall not modify or repair any equipment in revenue service without the approval of the Airports Authority's CO or COTR.

K No warranty period shall end unless finished documentation and deliverables are provided by the Contractor and approved by the Airports Authority.

22.3 Warranty Software Support Requirements

A PARCS software shall refer to the proprietary Contractor software and 3rd party software used in the PARCS.

B The Contractor shall provide the most recent software versions available at the time of the Factory Acceptance Test.

C The Contractor shall perform five (5) basic categories of tasks related to software support as part of the Maintenance Agreement:

1. Remote technical support.
2. On-site technical support.
3. Software development.
4. Upgrades and updates to Contractor-supplied application software.
5. System migration to new computer operation systems and relational database managers.

D The Contractor shall retain technical support and software development personnel who are familiar with the PARCS equipment and software, and who are qualified to perform the tasks described herein.

E The Contractor shall retain all software source codes and development and testing environments necessary to support and modify software for the Airports Authority PARCS.

F All PARCS software patches and updates shall be provided free of charge during the warranty period; however, the Airports Authority shall have the option of implementing the updates or not.

22.4 Warranty Staffing Coverage and Rates

A The Contractor's warranty personnel shall be on site during Regular Business Hours a minimum of eight (8) hours per day, five (5) days per week (Monday-Friday) for the warranty and repair of all hardware and software equipment provided under this contract. The Airports Authority shall determine the start and end times of the eight (8) hours for the Contractor staff to be onsite.

B During the normal warranty hours, should there be any repairs or modifications required (i.e., database, network, server, etc.), which the warranty personnel does not have the capability of changing, Contractor support personnel with the capabilities of making those repairs or changes shall be available either on-site or via a remote help desk to support the Contractor's warranty personnel.

C After hours support – For services outside of the Regular Business Hours, holidays, The Contractor shall provide rates in the Price Schedule Form to be in effect for the duration of the warranty period.

D Airports Authority-Recognized Holidays are defined below :

1. New Year's Day
2. Martin Luther King, Jr. Day
3. Memorial Day, Monday
4. Independence Day
5. Labor Day
6. Veteran's Day
7. Thanksgiving Day
8. Christmas Day

E The Airports Authority will not pay overtime charges.

F Response time – Response times shall vary depending on the phase of the project they are associated with. Once it is determined that assistance is needed, the COTR shall call the warranty personnel. The response time period begins once the call is placed. The response times for each phase is defined below:

1. Pre-System Acceptance Response Times: Response times during pre-System Acceptance are considered to take effect at the start of equipment installation and shall continue until System Acceptance has been reached. The Contractor shall:
   - a Respond to the on duty COTR within thirty (30) minutes of the Airports Authority's initial notification and;
   - b VPN into the system within thirty (30) minutes of responding to the notification or;
   - c Arrive onsite within one (1) hour of responding to the notification.
   - d Resolution within 4 hours of working VPN/onsite arrival.
2. Post-System Acceptance Response Times: Response times during post-systems acceptance are considered to take effect after System Acceptance has been reached and agreed to. The Contractor shall:
   - a Respond to the on duty Airports Authority within one (1) hour of the Airports Authority's initial notification and;
   - b VPN into the system within one (1) hour of responding to the notification or;
   - c Arrive onsite within two (2) hours of responding to the notification.
   - d Execute resolution of the problem within 4 hours of working VPN/onsite arrival.

G In addition, during the normal warranty hours, should there be any modifications required (i.e., database, network, server, etc.), which the warranty personnel does not have the capability of changing, Contractor support personnel with the capabilities of making those changes shall be available either on-site or via a remote help desk to support the Contractor's warranty personnel. If the severity of the warranty work demands after hours programming modifications, the appropriate rates outlined in the Price Schedule Form shall apply. These hours shall be tracked and highlighted as an additional cost in the report.

H Compensation for Unresponsiveness – In the event the Contractor fails to comply promptly with their obligations under these specifications or with a request by the Airports Authority to repair, replace or correct the failed components, subsystems, equipment or materials, the Airports Authority shall upon written notice to the Contractor, have the right to deduct the cost of labor and materials from any compensation due or become due to the Contractor. In the event the Contractor has been paid, the Contractor agrees to compensate the Airports Authority for the costs thereof.

22.5 Warranty Maintenance Documentation and Reporting

A The Contractor shall provide and utilize a Maintenance Tracking System to monitor and record all scheduled, requested, and performed maintenance services.

B The Contractor shall fill in all required fields, completely, for all Preventative Maintenance and Repair Services scheduled and performed. At a minimum the Maintenance Tracking System shall include:

1. Unique work order number
2. Device ID or component to be serviced
3. Identification of the problem/service to be performed
4. Date/time failure reported
5. Reporting party
6. Assigned technician
7. Corrective action code
8. Description of corrective action
9. Identification of replaced modules/parts or software patches/upgrades made
10. Date/time corrective action was tested and verified to be operational

C The Maintenance Tracking System database shall be kept on a component-by-component basis according to equipment number or component type. A component shall be defined as the major items within the PARCS, e.g. barrier gate, lane controller, workstation, etc. The maintenance database shall include a parameter driven reporting feature (by date, by component type, by specific module, by problem type) and inventory reports.

D The maintenance database shall also record all software and hardware updates.

E The maintenance database shall be accessible by the Airports Authority at any time during the warranty period.

F Thirty (30) days after the end of the Warranty period, the Contractor shall provide to the Airports Authority the data in the maintenance database in a file format that allows import into the Airports Authority's work order system CDRL 201.

G Maintenance Reporting:

1. All reporting requirements shall be determined at the time of Contract start.
2. The Airports Authority shall approve the maintenance report formats.

3. The reporting system shall be capable of providing, at a minimum, the following reports:
4. A Weekly Out-of-Service Report, indicating how long any lane was out of order CDRL 202 .
5. A monthly Repair Service report to the Airports Authority CDRL 203.
6. A monthly report of all preventative maintenance performed CDRL 204.
7. A monthly Maintenance Reports in the Airports Authority-approved format to designated personnel during the Contract period.

23 POST WARRANTY PREVENTATIVE MAINTENANCE AND REPAIRS

This section defines requirements related to the preventative maintenance and repair coverage and response times with optional contract extension periods.

23.1 General

A The Contractor shall provide a five (5) year post-warranty Maintenance Agreement for hardware and software support, repairs and preventative maintenance. The maintenance agreement shall include the same responsibilities, coverage, response times, and documentation requirements as the Warranty period.

B The Contractor shall provide five (5) 1-year Maintenance Agreement options to occur at the end of the 5-year Maintenance Agreement. Each Maintenance Agreement option shall include the same responsibilities, coverage, response times, and documentation requirements as the Warranty period

C Post Warranty Preventative Maintenance and Repairs shall occur after the one (1) year warranty period expires.

D The Contractor shall submit a Preventative Maintenance and Repairs Plan within sixty (60) days prior to System Acceptance. CDRL 205

E The Contractor warrants all systems/subsystems to comply with Section 24 PARCS Performance Standards.

F The Preventative Maintenance and Repairs Plan shall allow the COTR to perform scheduled preventative maintenance according to manufacturer guidelines and shall address the following:

1. Inspection.
2. Testing.
3. Necessary adjustments.
4. Lubrication.
5. Parts cleaning.
6. Replenishment and replacement of consumable items.
7. Software updates.

G Software Development, as it pertains to the Maintenance Agreement, is considered to be of two types – Enhancements and Error Corrections (bug fixes):

1. Enhancements are considered development that provides the Airports Authority with requested features that deviate from the COTS norm. They are any modifications or additions that, when made or added to the software materially changes its utility, efficiency, functional capability or application, but does not constitute an error correction. Prior to the start of development, the Contractor shall provide the Airports Authority with an estimate of hours required to deliver the enhancement and the normal labor rates provided in the Price Schedule Form shall apply to all development considered as an enhancement. Upon acceptance of a task order requiring an enhancement, the Contractor shall commence development as a Change Order to the Base Maintenance agreement.
2. Error Corrections are either a modification or an addition that, when made or added to the software, establishes material conformity of the software to the functional specifications, or a procedure or routine that, when observed in the regular operation of the software, eliminates the practical adverse effect experienced during operation. Upon notification of an error by the Airports Authority, the Contractor shall provide an estimate to completion of the development. Depending on the severity of the error, a work around may be necessary to provide the Airports Authority with a fully functional system. The Contractor and the Airports Authority shall together decide on what shall be done until the completion of the error correction. All costs associated with error corrections are incurred by the Contractor as part of the maintenance agreement.

H Regardless of the type of development, the Contractor shall provide regular status updates, shall test the completed software, and shall assist the Airports Authority as directed in the installation of the software change. All software development work performed under a task order issued by this contract shall be warranted by the Contractor against defects for a period of one (1) year after installation of the software.

I Upgrades and Updates to Contractor-Supplied Application Software:

1. If the Contractor releases version upgrades to the software or firmware for the PARCS equipment or CDMS while the Maintenance Agreement is in effect, the Airports Authority may opt to upgrade its software. If the Airports Authority opts to upgrade software, the labor required to test, configure, and install the upgrade on the Airports Authority's equipment shall be provided at no additional cost to the Airports Authority. Maintenance of such software and firmware products shall be provided at no additional cost to the Airports Authority.
2. Software and firmware products that replace or supersede installed products and are required for compliance with the functional or performance requirements of this contract shall be provided and installed at no additional cost to the Airports Authority, even if the products increase functionality and/or improves performance. Maintenance of such software and firmware products shall be provided at no additional cost to the Airports Authority.

J System Migration – Within two (2) years after each major release of the OEM operating system and relational database managers used as part of the CDMS, the Airports Authority may request the Contractor to migrate the

respective portions of the CDMS to the new OEM releases. At such times, the Airports Authority shall request a quote from the Contractor for the labor required to modify, test, deploy, and document the migration of the CDMS application software or database to the new OEM release. Upon acceptance of the ensuing task order, the Contractor shall perform the migration work, test the results, and deploy the upgraded CDMS in a controlled fashion as approved by the Airports Authority. All system migration work performed under a task order issued by this contract shall be warranted by the Contractor against defects for a period of one year after installation of the software. Labor required to correct defects in system migration under this contract shall not count against the labor bank.

K Contractor Personnel and Support Facilities – During the term of this contract, the Contractor shall:

1. Retain technical support and software development personnel who are familiar with the PARCS equipment and software, and who are qualified to perform the tasks described herein.
2. Retain all software source codes, development, and testing environments necessary to support and modify software for the Airports Authority's PARCS.

L Software Modification Procedures – While the Maintenance Agreement is in effect:

1. The Contractor shall test and document all software modifications prior to delivery to the Airports Authority. Documentation accompanying each software modification shall include comprehensive Software Release Notes. The Airports Authority shall review all software modifications and documentation.
2. When authorized by the Airports Authority, the Contractor shall install software modifications according to the Airports Authority –approved installation procedures. At its discretion, the Airports Authority may independently test and verify these modifications prior to authorizing the Contractor to install the modification.
3. The Contractor shall supply software modifications to correct all defects in the PARCS software arising from installation of any modification provided under the terms of the Extended Software Support Services option. No hours shall be incurred by the Airports Authority for this work.

M Source Code Documentation Updates – Within thirty (30) days of each anniversary of the commencement of the Maintenance Agreement, the Contractor shall deliver updates of all source code documentation, reflecting all changes incorporated to the PARCS equipment and CDMS software either directly to the Airports Authority or to an Airports Authority approved Escrow Agent. If the Contractor delivers the source code updates to an Escrow Agent, the Contractor shall at the same time deliver an updated inventory of the escrow deposit to the Airports Authority

N Throughout the Post-Warranty Maintenance period the Contractor shall be commpliant with PCI, ADA, and EMV standards referenced in section 4.5.C.

24 PARCS PERFORMANCE STANDARDS

This section defines requirements for minimum performance levels for various systems components, activities and operations.

24.1 General

A The Contractor shall provide Root Cause Analysis (RCA) to the Airports Authority on all business interruptive events, within five (5) business days from the occurrence, along with prevention solution to prevent future occurrences.

24.2 CDMS Performance

A The PARCS shall operate twenty-four (24) hours per day and seven (7) days per week.

1. The Contractor shall guarantee server and network uptime of 99.9%.
2. The CDMS on-line databases shall be 99.9% availability for any single component or associated interface.
3. A failure shall be defined as any malfunction that causes the loss of functionality according to specifications and if system performance levels (see Table 6) are not met.
4. A system failure is when the loss of more than one function occurs. System failures shall not occur more than 0.0001% of the time.

B The PARCS shall have minimum accuracy as defined below in Table 6 for each individual lane and cumulative for all lanes.

C The Contractor shall describe the process used for computing the exception algorithm calculations.

D The Contractor shall be fully responsible for any PARCS loss of revenue up to one million dollars ($1,000,000) for the duration of this contract as a result of the PARCS being offline, a delay in CDMS response time, or computational errors.

E The CDMS shall be of sufficient power and speed to perform its required functions as outlined in Table 6.

Table 6: CDMS Performance Levels

PARCS Requirements	Performance Levels	How Measured/Formula	Frequency
Fee Calculation Accuracy For paying customers, the fee will be calculated based on the Authority's rate structure for the parking facility.	99.9%	[[[Length of Time Parked] X [Rate]] + [Discounts]]]/ [Promotions] = [Fee] Data is gathered from PARCS Reports, Audit, and human observations to determine accuracy.	24 hours, 3 days, 7 days, 30 days
Entry Media Read Accuracy Media shall be read and processed accurately depending on its form and function and PARCS definitions.	99.9%	[No. of Entry Media Read Accurately] / [Total Number of Entry Media Presented] Reading and processing is dependent on the Entry Media definition associated with it.	24 hours, 72 hours, 7 days, 30 days
Unreadable Tickets Paper Ticket, Bank Card & QR Code Entry Media that the reader and/or PARCS does not recognize.	≤ 2%	[No. of Unreadable Tickets] / [Total Number of Tickets (Paper, Bank Card & QR Code) Presented] Reading and processing is dependent on the Entry Media definition associated with it.	24 hours, 72 hours, 7 days, 30 days
Revenue Amounts Total value of paid customers based on associated facility rate, discounts, promotions, and other PARCS definition that may affect rate calculation.	99.9%	[Revenue Amount Calculated and Processed by PARCS] / [True Amount Collected]	24 hours, 72 hours, 7 days, 30 days
Transaction Counts Each time a completed entry, payment or exit event occurs at a PARCS devices, it will be counted in a sequential manner.	99.9%	[Actual Transaction Counts] / [PARCS Calculated Transaction Counts]	24 hours, 72 hours, 7 days, 30 days

Exception Counts Each time an Exception Transaction occurs, it will be counted in a sequential manner.	99.9%	[Actual Number of Exception Counts] / [PARCS Calculated Exceptions Counts]	24 hours, 72 hours, 7 days, 30 days
Data Transmission Error Rate Data transmissions for the entire PARCS both on-site, 3rd party and Authority systems should be without error.	<1 message re-transmission /hr	Device journals transactions compared to PARCS reports, bankcard upload and accepted/rejected files.	24 hours, 72 hours, 7 days, 30 days
Access Control Reads Access Control cards/devices are accurately read and processed based on associated control definition.	99.9%	[Number of Access Control Devices Presented But Not Read/Processed Properly] / [Total Number of Access Control Devices Presented]	24 hours, 72 hours, 7 days, 30 days
Parking SCS Tool for maintaining a current count of the number of available parking spaces within each parking facility, area, and level of each garage as well as the overall counts for each facility as a whole.	95%	[Number of Available Spaces as Determined by PARCS SCS] / [Actual Number Of Available Spaces]	24 hours, 72 hours, 7 days, 30 days
Event Alarm Data To Monitoring Location Time	10 seconds	Time elapsed from when an event occurs at a device to when it is alarmed on a PARCS workstation.	24 hours, 72 hours, 7 days, 30 days
Poll Parking Facility for CDMS-to-Facility Communications Status.	Every 60 seconds	Take a facility lane device offline and measure the time until the PARCS workstation records the offline status.	24 hours, 72 hours, 7 days, 30 days
QR Code Reader Accuracy QR codes are read, communicated, and processed according to related code definition.	99.9%	[No. of QR Codes Accurately Read/Processed] / [Total No. Of QR Codes Presented] QR Codes are presented 1 time in a manner consistent with the technology	24 hours, 72 hours, 7 days, 30 days

The PARCS shall satisfy the transaction time requirements for non-human related factors as shown in Table 7.

Table 7: Transactional Time Requirements for all Non-Human Related Factors (NHRF)

Entry Events-	Maximum Time Constraint
For Transactions configured to print and issue a Paper Ticket; Paper Entry Ticket Dispensed at Entry Gate after button (virtual) is pushed.	3.0 seconds
For Transactions configured to print a Paper Ticket; Entry Gate Opens from the time the Paper Ticket is pulled from Entry device.	2.0 seconds
For Transactions configured to accept Virtual Ticket; Entry Gate Opens from time Virtual Ticket is presented.	3 seconds
Entry Gate closes from the time vehicle clears gate closing detection device.	1.0 second
Exit Events-	
Exit Gate Opens from the time a prepaid (fully paid) POF ticket is inserted. [This is not an Exceptions Transaction]	3 seconds
Exit Gate Opens from the time the QR code is presented [This is not an Exception Transaction]	3 seconds
Unstaffed Exit Events	
LPR sub- system processing/review process of the LPR and MLPI databases will add no more than the allotted time to the Exit Transaction listed in Unstaffed Exit Events: [This is not an Exception Transaction]	7 seconds

For All Entry Media, Except PARCS Credentials: From the time Entry Media is presented, payment processed, to when gate opens.	7 seconds
For Virtual Ticket Entry Media: From time Credential is presented to gate opens.	3 seconds
For transactions configured to print and issue a Receipt; From the time printed receipt is initiated to the time it is dispensed.	3 seconds
Exit Gate closes from the time vehicle clears gate closing detection device.	1 second
Cashier Events	
For Non Exception Cashier Transaction: From time Entry Media is presented to cashier, payment processed, to gate opens (Processing time does not include human delay factors).	15 Seconds
Transaction at POF Machine	
From the time Paper Ticket is inserted, payment processed, and pre-paid Paper Ticket returned to customer (Processing time does not include human delay)	7 second

A Failure to maintain these CDMS System Performance standards shall result in a System Acceptance failure, and final payment shall be withheld until the CDMS satisfies these standards consistently for thirty (30) consecutive days from the time of correction by the Contractor. This shall not be in effect for failures caused by fiber optic damage only. Repeated failure to correct shall constitute an event of default.

24.3 LPR Performance Standards

A The initial automated LPR review at exit shall not add more than seven (7) seconds to processing an exit transaction. This does not include LP reviews that require human intervention.

B LPR performance rates shall be computed over one 24-hour day, one week, and/or one month, depending on the tools and automated reports available in the PARCS to compute such performance rates.

C LP Capture - LPR subsystem shall acquire a vehicle's LP image at each public parking entry and exit lane at least ninety-nine (99%) percent of the time. This capture percentage shall be labeled as unobstructed, unobscured and unencroached (having no foreign object within .375 inches (3/8") of the license plate).

D LP Accuracy - LPR subsystem shall read all LP characters, exclusive of stacked characters, correctly eighty-five (85) percent of the time and shall read all but two (2) LP characters, exclusive of stacked characters, correctly 95 percent (95%) of the time.

E Entry and Exit Reviews – LPR subsystem shall have no more than fifteen (15%) percent of all entry and exits go to review at the IRW for any period greater than or equal to twenty-four (24) hours.

F No Match – LPR subsystem shall match at least eighty-five (85%) percent of the exit LPs to the corresponding entry record for any period greater than or equal to twenty-four (24) hours.

24.4 ACMS

A The access credential activation, deactivation, and blocking shall be recognized in the lane within two (2) minutes of performing such action at the PARCS workstation.

24.5 Pre-Booking Parking Reservation System

A The Contractor's hosting services shall provide 99.99% uptime and functionality

B The look up processes shall take less than thirty (30) seconds to allow the Airports Authority to search a reservation for customers who do not have the confirmation email, QR code or their access method credential with them at entry.

24.6 Space Count System

A The entry and exit signal shall be received within ten (10) seconds from the event and appropriate displays activated.

B The SCS shall provide accurate counts to within ± five (5) percent vehicles per level and per facility. The SCS accuracy shall apply to a twenty-four (24) hour period.

C The SCS interface shall update the signs within ten (10) seconds from entrance/exit event detection.

24.7 Report Generation

A PARCS report generation from the operational database shall be completed within thirty (30) seconds and archived data shall be completed within sixty (60) seconds for reports containing one (1) month of data or less.

B PARCS reports generation from the operational database shall be completed within two (two) minutes for reports containing twelve (12) months of data.

24.8 QR Code Reader

A Have a first read accuracy of not less than 99.5%.

24.9 Discount Production Device & Clamshell Validator

A The Discount Production Device and Clamshell Validator shall take less than five (5) seconds to create each discount/promotion/validation.

24.10 Warranty and Post Warranty Maintenance Agreement Period Performance

A Warranty and Maintenance Agreement payments shall be made monthly to the Contractor.

B Each month, within fifteen (15) days following the end of a month, the Contractor and Airports Authority staff shall meet to review PARCS performance and Contractor's maintenance staff performance results (as defined in Section 24) for the prior month. Minutes of these meetings shall become part of the permanent Contract file and shall be available to the Performance Bond Insurance Company throughout the maintenance period, if requested.

C The Airports Authority shall review the PARCS performance and the Contractor's performance based on the standards outlined in this section and below for Preventative Maintenance (PM) and Repair Services Maintenance (RS). The Contractor shall be required to submit a written report containing the reason for failure to meet the performance standards even if the failure is due to one of the allowed exceptions as stated herein.

D The Contractor shall submit monthly invoices that itemize the total invoice cost into scheduled PM task effort (set amount each month) and RS response effort (amount will vary based on actual effort performed each month).

E Preventative Maintenance Performance Requirements

1. The Contractor shall complete no less than ninety-eight percent (98%) of all Preventative Maintenance scheduled during the month. Percentages shall be calculated on the total number of Preventative Maintenance tasks scheduled for just that month and the total number of Preventative Maintenance tasks fully completed in the month even if the scheduled maintenance is a monthly, quarterly, or annual maintenance requirement. Partial completion of a scheduled Preventative Maintenance item shall not meet this requirement and shall not meet the Airports Authority's standards of fully completed. Any month that falls below this level shall require a written justification from the Contractor and with measures implemented to assure Airports Authority staff that performance will improve. For each percentage point below ninety-eight (98%) of total scheduled maintenance tasks that the Contractor does not complete, the Contractor's monthly invoice PM amount shall be reduced by one thousand dollars ($1,000.00). For example, if the Maintenance Tracking System indicates that the Contractor performed ninety-six percent (96%) of all scheduled maintenance tasks, the Contractor's monthly invoice shall be reduced by two thousand dollars ($2,000.00).
2. Factors beyond the control of the Contractor, such as unexpected delays in parts, delays due to accidents or damage created at no fault

of the Contractor, severe weather and unusual traffic volume during the holiday seasons shall be thoroughly documented in the Maintenance work order system and reported to the Airports Authority the next business day. The Airports Authority retains the right to determine if the non-performance was beyond the Contractor's control and is a valid reason for non-performance.

F Repair Service Maintenance and PARCS Performance Requirements

1. The Contractor shall provide three methods of notification to be used for repair contact information. The methods of notification shall provide a means of tracking the date and time the message was delivered. Examples of some documented communication include online customer portal, cell phone, and email.
2. PARCS performance requirements for Sections 24.1-9 shall not be computed each month. However if performance causes a noticeable decline in customer service or system use and reliability the Airports Authority shall compute performance levels for these areas and submit a repair request to the Contractor.
3. The Contractor shall respond in accordance with the response times defined in the Warranty section. Performance shall be calculated as the total number of response calls returned to the Airports Authority within the response time, for example 30 minutes divided by the total repair notifications placed in one month. For each percentage point (below 100%) of total repair maintenance calls that the Contractor does not respond to within 30 minutes, the Contractor's monthly invoice shall be reduced by five percent (5%) of its RS invoice amount. For example, if the Maintenance Tracking System indicates that the Contractor responded within 30 minutes to ninety-eight percent (98%) of all repair maintenance calls, the Contractor's monthly RS invoice amount shall be reduced by ten percent (10%).
4. Resolution of the situation within four (4) hours after notification is required in all situations. A temporary solution is acceptable in the event replacement parts are not available in inventory. Performance shall be calculated as the total number of repair events resolved within four (4) hours divided by the total repair notifications placed in one (1) month. For each percentage point below one hundred percent (100%) of total repair maintenance calls that the Contractor does not resolve within four (4) hours, the Contractor's monthly invoice shall be reduced by five percent (5%) of its RS invoice amount, unless the Airports Authority agrees that there were factors beyond the Contractor's control that prevented them from performing. For example, if the Maintenance Tracking System indicates that the Contractor resolved 98% of all repair maintenance calls within 4 hours or less, the Contractor's monthly invoice shall be reduced by ten percent (10%).
5. Factors beyond the control of the Contractor, such as unexpected delays in parts, accidents, severe weather, and unusual traffic, shall be thoroughly documented in the Maintenance work order system and reported to the Airports Authority the next business day. The Airports Authority may grant relief for the service hour requirement after reviewing these factors.

6. The Airports Authority shall cooperate with the Contractor to fully explore any concerns regarding service and performance standards.
7. The Airports Authority shall notify the Contractor in writing of performance problems with respect to the service standards within twenty (20) days after the end of each month based on the performance reports from the maintenance tracking system.
8. The Contractor shall be given thirty (30) days from receipt of notification to take corrective actions with respect to the problem identified by the Airports Authority or request relief.

24.11 Disaster Recovery

A Recovery Time Objectives (RTO) = fifteen (15) minutes for all PARCS component operating and performing to required levels.

B Recovery Point Objective = thirty (30) minutes.

APPENDICES

Appendix A: PARCS Base Bid Equipment Matrix

IAD Equipment Matrix

				Lane Type		POF	Lane Hardware												Other Hardware										Signage			
ID #	Facility	Lane Position (facing lane)	Lane/ Device #	Entry	Exit	POF Credit Unit	Entry Station	Exit Station	Cashier Station	Trans Panel	LPR	Barrier Gate	Intercom	1D/ QR Barcode Reader	Contactless Bankcard/NFC Reader	EMV Bankcard Chip Reader	Prox Reader	AVI Reader	Central Cashier Station	Point of Sale Hand-Helds	UPS	Valet Hand-Helds	360 Valet Camera	MLPI Hand-helds	MLPI Vehicle Units	Credit Card Refund Unit	Val/Discount Production Unit	Clam-Shell Validator	Entry Rate Signs	Lane VMS	Stacked Space Avail Signs	Per Level Space Avail Signs
1	Daily 1	Left	D1ET11	1			1				1	1	Reuse	1	1	1	1				1								1	1		
2	Daily 1	Right	D1ET12	1			1				1	1	Reuse	1	1	1	1	1			1								1	1		
3	Daily 1	Left	D1ET13	1			1				1	1	Reuse	1	1	1	1				1								1	1		
4	Daily 1	Center	D1ET14	1			1				1	1	Reuse	1	1	1	1				1								1	1		
5	Daily 1	Right	D1ET15	1			1				1	1	Reuse	1	1	1	1	1			1								1	1		
6	Daily 2	Right	D2ET21	1			1				1	1	Reuse	1	1	1	1	1			1								1	1		
7	Daily 2	Center	D2ET22	1			1				1	1	Reuse	1	1	1	1				1								1	1		
8	Daily 2	Left	D2ET23	1			1				1	1	Reuse	1	1	1	1				1								1	1		
9	Daily 2	Single lane	D2ET24	1			1				1	1	Reuse	1	1	1	1	1			1								1	1		
10	Economy Blue	Ctr	E1ET31	1			1				1	1	Reuse	1	1	1	1				1								1	1		
11	Economy Blue	Right	E1ET32	1			1				1	1	Reuse	1	1	1	1				1								1	1		
12	Economy Green	Left	E1ET33	1			1				1	1	Reuse	1	1	1	1				1								1	1		
13	Economy Green	Right	E1ET34	1			1				1	1	Reuse	1	1	1	1				1								1	1		
14	Hourly	Right	HOET01	1			1				1	1	Reuse	1	1	1	1	1			1								1	1		
15	Hourly		HOET02	1			1				1	1	Reuse	1	1	1	1				1								1	1		
16	Hourly		HOET03	1			1				1	1	Reuse	1	1	1	1				1								1	1		
17	Hourly		HOET04	1			1				1	1	Reuse	1	1	1	1	1			1								1	1		
18	Hourly	Left	HOET05	1			1				1	1	Reuse	1	1	1	1				1								1	1		
19	Economy Purple Public/Bus	Shared	AEPET92	1			1				1	1	1	1	1	1	1	Reuse			1								1	1		
20	Shuttle Bus		ANLET41	1								1						Reuse			1											
21	Economy Blue Bus	Left	AEBET95	1								1						Reuse			1											
22	Economy BMF Empl/Bus	Single	(12), (13)	1								1	1				1	1			1											
23	N. Remote Empl/Bus	Single	ANLRT41	1								1	1				1	Reuse			1											
24	Empl East		ELET01	1								1	1				1				1											
25	Empl East		ELET02	1								1	1				1				1											
26	Empl East Reserv	Single	ERET01	1								1	1				1				1											
27	North Remote Empl		NLET21	1								1	1				1				1											
28	North Remote Empl		NLET22	1								1	1				1				1											
29	North Remote Empl		NLET23	1								1	1				1				1											
30	North Remote Empl	Single	NLET24	1								1	1				1				1											
31	Empl West Reserve	Single	WRET01	1								1	1				1				1											
32	Empl West Reserve	Single	WRET02	1								1	1				1				1											
33	Test Bed		NA	1			1				1	1		1	1	1	1	1														
	Total New Entry Hardware			**33**	**0**	**0**	**20**	**0**	**0**	**0**	**20**	**33**	**12**	**20**	**20**	**20**	**31**	**8**	**0**		**32**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**19**	**0**	**0**
	Total Reused Entry Hardware			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**0**	**0**	**0**	**0**	**4**	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

IAD Equipment Matrix

				Lane Type		POF	Lane Hardware												Other Hardware										Signage			
ID #	Facility	Lane Position (facing lane)	Lane/ Device #	Entry	Exit	POF Credit Unit	Entry Station	Exit Station	Cashier Station	Trans Panel	LPR	Barrier Gate	Intercom	1D/ QR Barcode Reader	Contactless Bankcard/NFC Reader	EMV Bankcard Chip Reader	Prox Reader	AVI Reader	Central Cashier Station	Point of Sale Hand-Helds	UPS	Valet Hand-Helds	360 Valet Camera	MLPI Hand-helds	MLPI Vehicle Units	Credit Card Refund Unit	Val/Discount Production Unit	Clam-Shell Validator	Entry Rate Signs	Lane VMS	Stacked Space Avail Signs	Per Level Space Avail Signs
34	Hourly Oversize	Left	Gate (13)		1							1																				
35	Hourly Oversize	Right	Gate (13)		1							1																				
36	Daily 1	Left	D1EX61		1			1			1	1	Reuse	1	1	1	1				1									1		
37	Daily 1		D1EX62		1			1			1	1	Reuse	1	1	1	1				1									1		
38	Daily 1		D1EX63		1			1			1	1	Reuse	1	1	1	1				1									1		
39	Daily 1		D1EX64		1				1	1	1	1	Reuse	2	2	2	1				1									1		
40	Daily 1		D1EX65		1			1			1	1	Reuse	1	1	1	1				1									1		
41	Daily 1		D1EX66		1			1			1	1	Reuse	1	1	1	1	1			1									1		
42	Daily 1	Right	D1EX67		1				1	1	1	1	Reuse	2	2	2	1				1									1		
43	Daily 2	Left	D2EX71		1				1	1	1	1	Reuse	2	2	2	1				1									1		
44	Daily 2		D2EX72		1			1			1	1	Reuse	1	1	1	1				1									1		
45	Daily 2		D2EX73		1			1			1	1	Reuse	1	1	1	1	1			1									1		
46	Daily 2		D2EX74		1				1	1	1	1	Reuse	2	2	2	1				1									1		
47	Daily 2		D2EX75		1			1			1	1	Reuse	1	1	1	1				1									1		
48	Daily 2	Right	D2EX76		1			1			1	1	Reuse	1	1	1	1	1			1									1		
49	Daily 2	Single	D2EX77		1			1			1	1	Reuse	1	1	1	1				1									1		
50	Hourly Valet Entry	Single	HOEX50 (14)		1			1			1	1	Reuse	1	1	1	1	1			1		1						1	1		
51	Valet Office		No ID											2	2	2			2			5										
52	Valet Free Exit	Single	No ID (15)		1							1																				
53	Valet Ops Exit	East of Lane 50	No ID (15)		1							1																				
54	Hourly	Left	HOEX51		1				1	1	1	1	1	2	2	2	1				1									Reuse		
55	Hourly		HOEX52		1			1			1	1	1	1	1	1	1				1									Reuse		
56	Hourly		HOEX53		1			1			1	1	1	1	1	1	1				1									Reuse		
57	Hourly		HOEX54		1				1	1	1	1	1	2	2	2	1				1									Reuse		
58	Hourly		HOEX55		1			1			1	1	1	1	1	1	1				1									Reuse		
59	Hourly	Right	HOEX56		1			1			1	1	1	1	1	1	1	1			1									Reuse		
60	Hourly	Left	HOEX57		1			1			1	1	1	1	1	1	1				1									Reuse		
61	Hourly	Center	HOEX58		1			1			1	1	1	1	1	1	1				1									Reuse		
62	Hourly	Right	HOEX59		1				1	1	1	1	1	2	2	2	1				1									Reuse		
63	Economy	Left	E1EX81		1			1			1	1	1	1	1	1	1				1									1		
64	Economy	Center	E1EX82		1			1			1	1	1	1	1	1	1				1									1		
65	Economy	Right	E1EX83		1				1	1	1	1	1	2	2	2	1				1									1		
66	Economy	Left	E1EX84		1			1			1	1	1	1	1	1	1				1									1		
67	Economy	Center	E1EX85		1			1			1	1	1	1	1	1	1				1									1		
68	Economy	Right	E1EX86		1				1	1	1	1	1	2	2	2	1				1									1		
69	Economy	Left	E1EX87		1				1	1	1	1	1	2	2	2	1				1									1		
70	Economy	Center	E1EX88		1			1			1	1	1	1	1	1	1				1									1		
71	Economy	Right	E1EX89		1			1			1	1	1	1	1	1	1				1									1		
72	Economy Green Public/Bus	Right	AEGEX94		1			1			1	1	1	1	1	1	1	Reuse			1									1		
73	Economy Blue Bus	Far left by entry	AEBEX96		1							1						Reuse			1											
74	Economy BMF Empl/Bus	Single	(12), (13)		1							1	1				1	1			1											
75	N. Remote Empl/Bus	Right	NLXT33		1							1	1				1	Reuse			1											
76	Empl East		ELXT01		1							1	1				1				1											
77	Empl East		ELXT02		1							1	1				1				1											
78	Empl East Reserv	Single	ERXT01		1							1	1				1				1											
79	North Remote Empl	Single	NLXT31		1							1	1				1				1											
80	North Remote Empl	Left	NLXT32		1							1	1				1				1											
81	North Remote Empl		NLXT34		1							1	1				1				1											
82	North Remote Empl		ANLXT45 ANLXT46		1							1	1				1	1			1											
83	Empl West Reserve	Single	WRXT02		1							1	1				1				1											
84	Empl West Reserve	Single	WRXT02		1							1	1				1				1											
85	Test Bed		NA		1			1	1	1	1	1		3	3	3	1	1														
	Total New Exit Hardware			**0**	**51**	**0**	**0**	**25**	**11**	**11**	**35**	**51**	**30**	**49**	**49**	**49**	**46**	**8**	**2**		**46**	**5**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**25**	**0**	**0**
	Total Reused Exit Hardware			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**0**	**3**	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**0**

IAD Equipment Matrix

				Lane Type		POF	Lane Hardware												Other Hardware										Signage			
ID #	Facility	Lane Position (facing lane)	Lane/ Device #	Entry	Exit	POF Credit Unit	Entry Station	Exit Station	Cashier Station	Trans Panel	LPR	Barrier Gate	Intercom	1D/ QR Barcode Reader	Contactless Bankcard/NFC Reader	EMV Bankcard Chip Reader	Prox Reader	AVI Reader	Central Cashier Station	Point of Sale Hand-Helds	UPS	Valet Hand-Helds	360 Valet Camera	MLPI Hand-helds	MLPI Vehicle Units	Credit Card Refund Unit	Val/Discount Production Unit	Clam-Shell Validator	Entry Rate Signs	Lane VMS	Stacked Space Avail Signs	Per Level Space Avail Signs
86	Terminal	NA	NA			15							15	15	15	15					15											
87	Test Bed	NA	NA			1								1	1	1																
88	Daily 1		Level 1																												Reuse	
89	Daily 1		Level 2																													Reuse
90	Daily 1		Level 3																													Reuse (2)
91	Daily 1		Level 4																													Reuse (2)
92	Daily 2		Level 1																												Reuse	Reuse
93	Daily 2		Level 2																													Reuse (2)
94	Daily 2		Level 3																													Reuse (2)
95	Daily 2		Level 4																													Reuse (2)
96	PARCS Workstations	NA	NA																													
97	IRWS/PARCS Monitoring Workstations	NA	NA																													
98	Admin Office	NA	NA																	4						1	1	10				
99	Daily 2 Office	NA	NA																	4				9	3							
	Total New Other Hardware			**0**	**0**	**16**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**16**	**16**	**16**	**0**	**0**	**0**	**8**	**15**	**0**	**0**	**9**	**3**	**1**	**1**	**10**	**0**	**0**	**0**	**0**
	Total Reused Other Hardware			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**12**
	Grand Total New Hardware			**33**	**51**	**16**	**20**	**25**	**11**	**11**	**55**	**84**	**57**	**85**	**85**	**85**	**77**	**16**	**2**	**8**	**93**	**5**	**1**	**9**	**3**	**1**	**1**	**10**	**20**	**44**	**0**	**0**
	Grand Total Reused Hardware			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**33**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**2**	**12**

Notes

1. PARCS AVI readers must be able to read IAD's Operations and Ground Transportation TransCore eGo Plus transponders currently used.
2. All AVI will be ceiling mounted and will be in the far right non-cashier lane unless otherwise noted.
3. Provide additional equipment protection for all devices, especially protruding portions of equipment extending beyond the island curb.
4. Relocate existing bollards if needed.
5. Paint all bollards and lane islands at the completion of installation.
6. Remove fee displays from all cashier booth lanes. Will use transaction panel as the fee display.
7. Daily 1 and Daily 2 Garages - Remove existing red/green lane lights in all lanes including booth mounted lights.
8. Daily 1 Garage - Remove static rate signs in each lane and replace with LED rate signs like DCA
9. Daily 1 and Daily 2 Garages - Relocate the Per Level Space Available signs as shown in the Appendices.
10. Entry/Exit lane VMS:

10a. Hourly Lot - Reuse exit lane VMS, mount entry lane VMS on the façade of the overhead canopies to be provided by MWAA.
10b. Daily 1 Garage - Mount VMS on canopy facade if visible in sunlight for all entry/exit lanes.
10c. Daily 2 Garage West Entry - Mount exit lane VMS on overhead column where current lane banners are located.
10d. Daily Garage 2 North Entry - Mount entry lane VMS overhead inside garage on 3rd column from the garage entry.
10e. Economy Lot - Mount VMS on canopy facade if visible in sunlight for all entry/exit lanes. Entry lane canopies to be provided by MWAA.

11. Space count system differential counters at locations D1DC82 (Daily 1) and D2DC81 (Daily 2) use Fortress Telecom Power (750VA) UPS's. All others are PowerWare 5115 Power (500VA) and Alpha Novus 5000RM Power (5000VA).
12. Currently use clickers to vend gate.
13. Connect the existing gates to the FMS - not currently connected to the FMS.
14. Ingest tickets within comp time and vend gate for access to valet area. Accept credit card payment for tix greater than comp time. AVI, lane rate sign and VMS to be pole- mounted where existing red/green light is located.
15. Free exit with two lane loops.

Appendix B: Contract Deliverable Requirements List

Contract Deliverables Requirements List (CDRL)					
			Required For		
CDRL #	Submittal Description	Section	PDR	FDR	Other
101	Electrical design	4.4.L.2	x		
102	Loop drawings	4.4.L.4	x		
103	ADA Compliance Report	4.5.D	X		
104	Evaluation of Existing Conditions Report	4.6.D	X		
105	Deliver manuals, training, stock, special tools	4.10.F			
106	PARCS system architecture design	5.1.N	X	X	
107	CDMS Design Functionality Manual	5.1.O	X	X	
108	CDMS Performance and Configuration Requirements	5.2.E 5.5.P.3	X		
109	CDMS PA DSS Certification	5.2.F.6			NTP + 30 days
110	Server failover and failback procedure	5.3.C	X		
111	List of PARCS functions requiring dedicated workstations	5.4.C	X		
112	CDMS application server requirements	5.3.E	X		
113	PARCS communications protocol configuration	5.5.C	X		
114	PARCS Network and Architecture Diagram	5.5.E	X	X	
115	Fiber optic specifications	5.5.M	X		
116	Data Redundancy Plan	5.6.C, L	X	X	
117	Database failover and failback procedure	5.6.D	X	X	
118	CDMS ERD Diagram and Data Dictionary	5.6.M, O	X	X	
119	Data Table Map	5.6.P	X	X	
120	Data storage server requirements	5.7.H	X		
121	CDMS Archiving and Back Up Plan	5.8.D	X	X	
122	CDMS licenses for at least 50 concurrent users	5.9.D		X	
123	CDMS software licenses and tools used	5.9.F	X	X	
124	Custom software escrow	5.9.K		X	
125	Change management transition plan	5.10.A	X	X	
126	Information modification procedures	5.11.D		X	
127	CDMS remote access interface	5.12.J		X	
128	LPR functionality during communication failure	5.13.H	X		
129	CDMS Disaster Recovery Plan	5.14.A	X	X	
130	Transition plan to cloud-hosted services	5.14.F	X	X	
131	PARCS fully PCI-DSS compliant	7.10.A			NTP + 30 days
132	Payment application is PA-DSS compliant	7.10.A			NTP + 30 days
133	Payment application approved and listed on PCI SSC	7.10.A			NTP + 30 days
134	POI devices approved on PCI SSC	7.10.A			NTP + 30 days
135	Impact of dual transactions on system counts	8.5.H	X		
136	Monthly permit reconciliation process	8.9.E	X	X	
137	List of standard PARCS reports	16.1.A	X	X	
138	Design of add-on readers	17.4.B	X	X	
139	EMV compliance certification	17.4.G.6			90 days prior to installation
140	EMV compliance re-certification	17.4.G.7			60 days prior to Warranty start
141	Ticket creation and risk of fraudulent tickets	17.6.B	X	X	
142	Split Payment Transaction Description	17.10.D.15	X	X	
143	Booth Transaction Panel Design	17.10.E.1	X	X	
144	Engineering drawings for LPR lane equipment	17.16.E	X	X	
145	LPR Camera Installation Plan	17.6.H	X	X	
146	Lighting Code Requirements List	17.6.H	X	X	
147	Spare parts list	17.20.C	X		
148	Spare parts inventory system	17.20.I	X		
149	Proximity card graphics	17.21.D	X		
150	AVI transponder graphics	17.21.E	X		
151	Project Management Plan	18.1.M			NTP + 30
152	Master Project Schedule (Draft)	18.1.O			NTP + 30
153	Master Project Schedule (Final)	18.1.Q			NTP + 90
154	Monthly Progress Report	18.1.R			5th day monthly
155	Project document control application	18.1.U	X		
156	Hardware Update Plan	18.3.E.3			Post-FAT
157	Hardware Equipment Inventory Record	18.3.E.4			Ongoing
158	Post-FAT Software Upgrades and Release Notes	18.3.F.2			Post-FAT
159	Design Review Agenda and Package	18.3.I.2	X	X	14 days prior to each review
160	Conceptual Design Review Package	18.3.J.1			
161	Preliminary Design Review Package	18.3.K.2	X		
162	Final Design Review Package	18.3.L.4		X	
163	Fat Acceptance Testing Script	18.4.B.15			30 days prior to FAT
164	Factory Acceptance Testing Report	18.4.B.20			Final day of FAT
165	Factory Acceptance Testing Server Build Report	18.4.C.2			Final day of FAT
166	Post-Installation Field Test Script	18.4.D.5.b			30 days prior to Post-Install test
167	Installation and Cutover Plan	18.4.D.6.b	X	X	
168	Overall Inspection and Acceptance Test Plan	18.4.D.10.a			30 days prior to Acceptance Testing
169	Training Plan	18.5.C	X	X	

Contract Deliverables Requirements List (CDRL)					
			Required For		
CDRL #	Submittal Description	Section	PDR	FDR	Other
170	Training DVD	18.5.C			During training
171	Training Lesson Plans	18.5.L			60 days prior to training
172	Instructors Guide	18.5.P			60 days prior to training
173	Student Instructional Materials	18.5.Q			30 days prior to training
174	Technician Certifications	18.6.B.2		X	
175	Equipment Installation Drawings	18.6.D.1			60 days prior to PARCS delivery
176	Cashier Station Layout Plan	18.6.I.4	X	X	
177	Interconnect Diagram	18.6.J.2.c		X	
178	Sealant Specification	18.6.J.4	X		
179	Operating Instruction Manual	18.6.K.1		X	
180	Preventative Maintenance Manual	18.6.K.2		X	
181	Corrective Maintenance Manual	18.6.K.3		X	
182	Shop Repair and Overhaul Manual	18.6.K.4		X	
183	Parts Manual	18.6.K.6		X	
184	Software and Programming Manual	18.6.K.7		X	
185	Software Data File Manual	18.6.K.8		X	
186	Field Maintenance Quick Reference Guide	18.6.K.9		X	
187	CDMS OEM Manuals	18.6.L.1	X	X	
188	CDMS Administrator's Manual	18.6.L.2	X	X	
189	CDMS User Manuals	18.6.L.3	X	X	
190	CDMS Report Formatting Manual	18.6.L.4	X	X	
191	Database Structure Manual	18.6.L.5	X	X	
192	CDMS Network Architecture	18.6.L.6	X	X	
193	CDMS External Interface Manual	18.6.L.7	X	X	
194	Bankcard Clearing House Interface Manual	18.6.L.8	X	X	
195	Special Tools and Equipment Manual	18.6.L.9	X	X	
196	Drawings	18.6.O.1.a			30 days after System Acceptance
197	Quality Assurance Program Plan	19.1.D			NTP + 60
198	Warranty Plan	19.1.I		X	Final version 90 days prior to PARCS delivery
199	Warranty Repair Agreement	20.2.D		X	Final version 90 days prior to PARCS delivery
200	Preventative Maintenance Schedule	20.2.E		X	30 days prior to fist lane install
201	Maintenance database file	20.5.F			30 days after Warranty
202	Weekly Out-of-Service Report	20.5.G.4			Weekly
203	PARCS Repair Log	20.5.G.5			Monthly
204	Preventative Maintenance Report	20.5.G.6			Monthly
205	Preventative Maintenance & Repairs Plan	21.1.D			60 days before System Acceptance
206	Test Bed Installation Plan	17.19.A	X	X	

Appendix C: Sample Reports

Cashier Performance Analysis
For the Month of: August 2013

Cashier	Total Tix	Rev Per Ticket	Cash Rev Per Tix	Total Excep Trans	% Excep Trans	% of Cashier's Total Transactions: Grace	Lost	Stolen	Swapped	Unreadable Paper Tix	Unreadable Bank Card	Unreadable QR Code Tix	Validations	Cancel
Cashier A	500	$7.50	$3.85	142	28.4%	0.40%	0.20%	2.4%	4.0%	7.2%	3.2%	6.0%	2.0%	3.0%
Cashier B	450	6.30	4.50	51	11.3%	0.22%	0.00%	0.7%	0.9%	5.8%	0.4%	9.0%	0.4%	1.3%
Cashier C	200	8.20	3.20	67	33.5%	1.50%	0.00%	0.5%	3.5%	20.0%	2.5%	2.6%	0.5%	4.5%
Avg. / Total %	1150	$6.75	$3.80	260	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Cashier	Total Tix	Rev Per Ticket	Cash Rev Per Tix	Total Excep Trans	# of Cashier's Total Transactions: Grace	Lost	Stolen	Swapped	Unreadable Paper Tix	Unreadable Bank Card	Unreadable QR Code Tix	Validations	Cancel
Cashier A		$7.50	$3.85	142	2	1	12	20	36	16	30	10	15
Cashier B		6.30	4.50	51	1	-	3	4	26	2	7	2	6
Cashier C		8.20	3.20	67	3	-	1	7	40	5	1	1	9
Avg. / Total Trans		$6.75	$3.80	260	6	1	16	31	102	23	38	13	30

C.2: Validations by Cashier

Validations by Cashier
For the Month of: August 2013

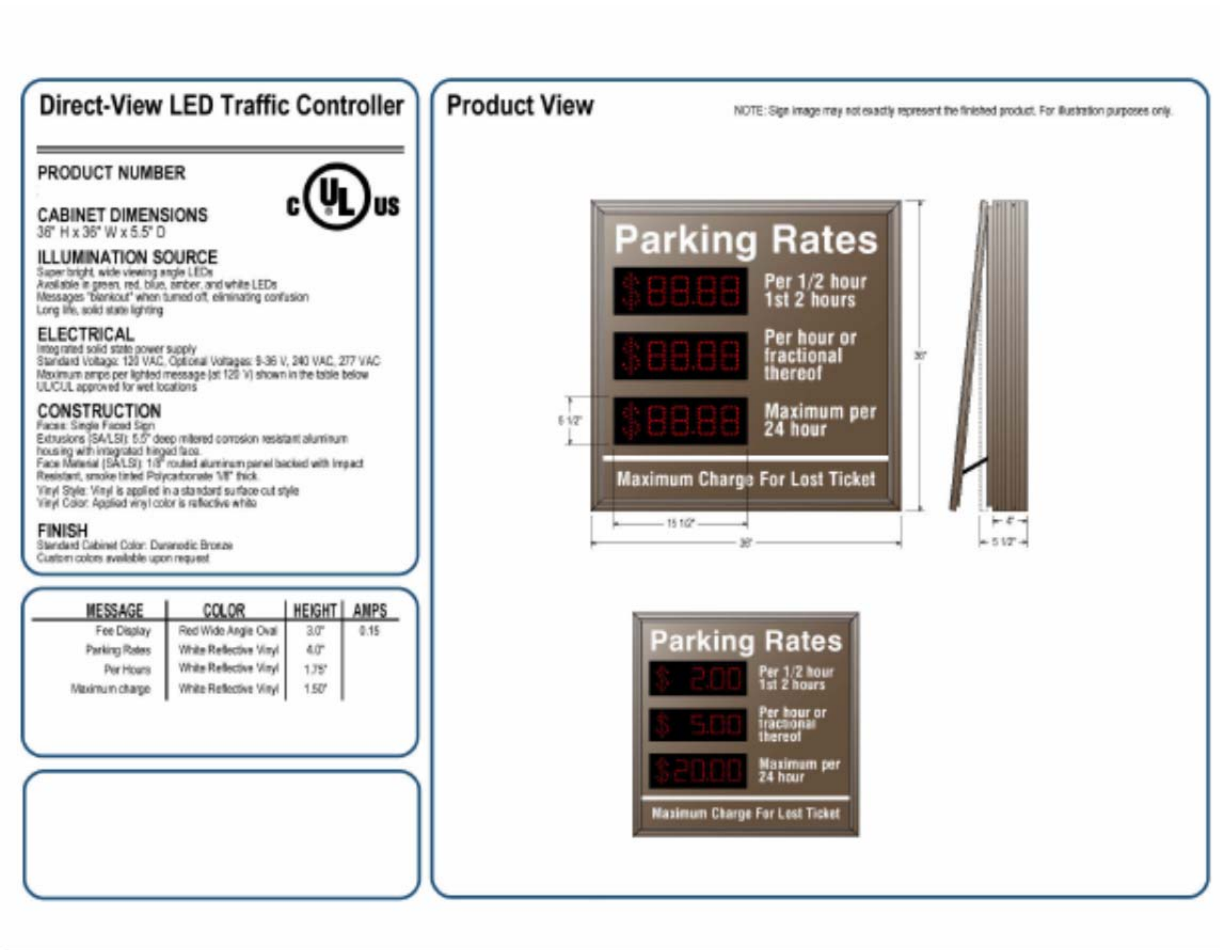
of Cashier Validation Transactions for the Month

Cashier	Val #1	Val #2	Val #3	Val #4	Val #5	Val #6	Val #7	Val #8	Val #9	Val #10	Val #11	Val #12
Cashier A												
Cashier B												
Cashier C												
Total # of Vals	-	-	-	-	-	-	-	-	-	-	-	-
% of Total Tix	-	-	-	-	-	-	-	-	-	-	-	-

$ Amount of Cashier's Validation Transactions for the Month

Cashier	Val #1	Val #2	Val #3	Val #4	Val #5	Val #6	Val #7	Val #8	Val #9	Val #10	Val #11	Val #12
Cashier A	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cashier B												
Cashier C												
$ Total	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Avg $ per Ticket	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Appendix D: Entry Lane Variable Message Rate Sign



Direct-View LED Traffic Controller

PRODUCT NUMBER

CABINET DIMENSIONS
36" H x 36" W x 5.5" D

ILLUMINATION SOURCE
Super bright, wide viewing angle LEDs
Available in green, red, blue, amber, and white LEDs
Messages "blankout" when turned off, eliminating confusion
Long life, solid state lighting

ELECTRICAL
Integrated solid state power supply
Standard Voltage: 120 VAC, Optional Voltages: 9-36 V, 240 VAC, 277 VAC
Maximum amps per lighted message (at 120 V) shown in the table below
UL/CUL approved for wet locations

CONSTRUCTION
Faces: Single Faced Sign
Extrusions (SA/LSI): 5.5" deep mitered corrosion resistant aluminum housing with integrated hinged face.
Face Material (SA/LSI): 1/8" routed aluminum panel backed with Impact Resistant, smoke tinted Polycarbonate 1/8" thick.
Vinyl Style: Vinyl is applied in a standard surface cut style
Vinyl Color: Applied vinyl color is reflective white

FINISH
Standard Cabinet Color: Duranodic Bronze
Custom colors available upon request

MESSAGE	COLOR	HEIGHT	AMPS
Fee Display	Red Wide Angle Oval	3.0"	0.15
Parking Rates	White Reflective Vinyl	4.0"	
Per Hours	White Reflective Vinyl	1.75"	
Maximum charge	White Reflective Vinyl	1.50"	

Product View

NOTE: Sign image may not exactly represent the finished product. For illustration purposes only.

Appendix E

- Electronic Communications Policy
- Patch Management Policy
- Network Design Manual
- Information Security Standards
-

DIRECTIVE

IT-001B

Metropolitan Washington Airports Authority

Electronic Communications Systems

DISTRIBUTION: All Employees

OPI: MA-600

DATE: August 2014

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

MEMORANDUM

To: All Airports Authority Employees

From: Goutam Kundu, MA-600

Subject: Revised Airports Authority Electronic Communications Systems Directive

Date: August 1, 2014

Enclosed is the revised Electronic Communications Systems Directive, which sets forth the policy and procedures governing the use of all Airports Authority electronic communications systems and supporting equipment.

The major revisions of this Directive relate to Enterprise Network access policy and procedures and the use of Unified Communications Systems, specifically, Instant Messaging.

All employees and contractors will be required to provide electronic acknowledgement, via the Airports Authority Learning Management System (Skill Soft), that they agree to abide by the procedures set forth in the Directive. A separate notification with instructions will be issued via email by the Organization Development Department.

This Directive is readily accessible for reference on the Airports Authority intranet (Livelink).

GK:Jb-e/cap

Attachment

ELECTRONIC COMMUNICATIONS SYSTEMS

FOREWORD

This Directive defines the Metropolitan Washington Airports Authority (Airports Authority) policy and procedures governing use of all Airports Authority electronic communications systems and the equipment that supports and delivers the systems. Advances in electronic communications technology provide remarkable business opportunities and advantages; they also have significant implications that present complex legal issues surrounding business information and its security.

All electronic communications systems, as well as all supporting equipment provided by the Airports Authority are the sole property of the Airports Authority. The Airports Authority retains the right to, and may at any time, monitor the use of these systems by Airports Authority employees and others, as it deems appropriate and consistent with applicable law. By following the policies and procedures contained in this Directive, Airports Authority employees and other authorized users of Airports Authority electronic communications systems will be able to use such systems to their fullest extent.

As communications technology becomes more sophisticated, the Airports Authority will make every effort to ensure that its electronic communications systems and services are secure and used effectively to accomplish Airports Authority goals.

This Directive supersedes the Directive titled "Electronic Communications Systems," IT-001A, dated December 2012. The major revisions include Section 5.0, Access to Electronic Communications Systems, and Section 6.3 (5), the use of Unified Communications Systems, specifically, Instant Messaging. As well, employees and contractors will be required to sign an Acknowledgement (Appendix A) agreeing to abide by the procedures set forth in this Directive.

John E. Potter
President and Chief Executive Officer

7/17/14
Date

TABLE OF CONTENTS

1.0 Purpose

The Airports Authority provides electronic communications systems and associated equipment to enable Users to accomplish the Airports Authority mission and to promote the efficient conduct of Airports Authority business. All electronic communications systems and associated equipment provided by the Airports Authority are the sole property of the Airports Authority.

Users are expected to use these systems and associated equipment in an appropriate and professional manner. Users must ensure that they do not compromise the safety or security of these systems or equipment, and that they do not interfere with Airports Authority operations, including using any personal electronic equipment brought to the workplace.

This Directive establishes the Airports Authority's standards and User responsibilities regarding access to and use of electronic communications systems and associated equipment, as well as access to and use of the information communicated via these systems and equipment. This Directive is intended to be, and is to be interpreted and applied in a manner that is, consistent with the Airports Authority Freedom of Information Policy.

2.0 Definitions

Authorized Personnel: Individuals who have been authorized by the Airports Authority to perform functions relating to or involving one or more Airports Authority electronic communications systems and associated equipment and to engage in activities consistent with the scope of that authorization.

Confidential Information: Information in the possession of the Airports Authority that is considered, or reasonably should be considered, to be confidential or proprietary and not to be disclosed to any persons other that those with a Need to Know (e.g., Personally Identifiable Information and Private Information, as defined below).

Directive: This Electronic Communications Systems Directive as it may be amended from time to time.

Electronic Communications Network: The integrated series of Airports Authority facilities consisting of Airports Authority electronic communications systems and the Network that enable these systems to communicate with each other and enable Users to access, and to create and retrieve information in the integrated system.

Need to Know: With respect to particular information or documents (whether electronic or physical) that contain the particular information, Need to Know (i) when used in conjunction with the Airports Authority employees refers to the need of the employees to have access to the information or documents in order to perform the duties and responsibilities of their positions with the Airports Authority, and (ii) when used in

conjunction with other persons, refers to persons employed by a federal or state agency who, as determined by the Office of General Counsel, have a substantial need to have access to the information or documents in order to perform their official duties and responsibilities or have the legal authority to compel the Airports Authority to provide such access.

Personally Identifiable Information (PII): Information that can be used on its own or with other information to identify, contact, or locate a particular individual (e.g., Social Security number, driver license number).

Private Information (PI): Information regarding a particular individual that is of a personal nature and, when created, was not intended to be made public (e.g., performance issues, discipline record, medical files).

Prohibited Use: Use of an Airports Authority electronic communications system by a person not authorized to use the system, or use of such a system by a User that exceeds the User's authorization or that is barred by this Directive.

System Custodian: As to any of the Airports Authority's electronic communications systems, the Airports Authority office that is responsible for the operation and administration of the system, including providing persons authorization to use the system.

User: An employee, officer, volunteer, and contractor of the Airports Authority, an employee of an Airports Authority contractor, and another person who has been authorized to use one or more Airports Authority electronic communications systems.

3.0 Electronic Communications Systems

The Airports Authority makes numerous electronic communications systems and associated equipment available to Users, including:

1) Telephone systems (including portable, cellular, satellite, voice over internet protocol, voicemail system and Smartphone).

2) Computer systems (e.g., laptops, workstation, iPads, local and wide area networks).

3) Electronic data systems (e.g., Enterprise Resource Planning (ERP), PropWorks, Geographic Information Systems (GIS).

4) Email systems.

5) Facsimile systems.

6) Two-way radio systems.

7) Unified communications systems (e.g., instant messaging and video conferencing).

4.0 Electronic Communications Systems Provider

The Airports Authority provides and supports its electronic communications systems through the Office of Technology. Within the Office of Technology, the Technology Operations Department:

1) Provides telephone systems and pagers support, and works with consolidated functions and the Airport Administration Departments to provide the support for facsimile machines;

2) Provides network, hardware, and software advice and support for the various Airports Authority communications systems, including telephone, email, and unified communications systems.

3) Develops and publishes, in conjunction with other appropriate Airports Authority offices, information technology policies and standards applicable use of Airports Authority communications systems; and

4) Provides and supports the two-way radio communications systems used by the Office of Public Safety, Airport Operations, and the Mobile Lounge Department. Two-way radios are also supported by Engineering and Maintenance Department at the two airports.

5.0 Access to Electronic Communications Systems

It is essential that only expressly authorized persons have access to the Airports Authority IT services and applications. The following procedures are to be utilized both for providing and for terminating such authorization.

1) User access to any electronic communications system within the Electronic Communications Network must be authorized: (i) in the case of an Airports Authority employee, by the manager of the department within which the employee works; and (ii) in the case of an employee of an Airports Authority contractor, by the manager of the department which is administering the contractor's contract, along with the recommendation of the contracting officer's technical representative for the contract. In addition, access to any electronic communications system managed by a department other than the user's department must be authorized by the manager of that other department.

2) Service-Now User Access forms shall be used for all system access requests. Service-Now tickets will be created and assigned to responsible employees within IT to process the requested changes.

3) Users may access MWAA electronic communications systems only through Airports Authority controlled devices. These devices include MWAA desktops, laptops, tablets, and written waivered personal smartphones. These are the only devices authorized to access the MWAA electronic communications systems. All other access devices are considered unauthorized and must be redirected to the MWAA-GUEST Wi-Fi Network.

4) When the employment of an employee User terminates, the employee's direct supervisor is responsible for completing a Service-Now User Access Request/Departure Form, preferably in advance.

5) All temporary employee or contractor access will be terminated automatically at close of business on the end date identified when access is requested. Temporary employee or contractor User access records contain end dates based on the last day of work at the Authority or October 15 of the current year.

6) Any User accounts not used for 30 consecutive days or with expired passwords for longer than five days will be deactivated.

All Authority managers should review the Enterprise Communication Network Access Procedures in the MA-600 folder on Livelink. The Service-Now User Access Request/Departure Form is available on the Service-Now Website, which can be accessed by clicking through the following sequence:
https://mwaa.service-now.com/

6.0 Electronic Communications Systems Security

6.1 Physical Security

The Airports Authority's electronic communications systems consist of hardware, software, protocols, and a variety of components at various locations. The Airports Authority is responsible for establishing and enforcing standards to protect the security of all these electronic communications systems. To that end, the following applies:

1) No *modifications* may be made by any person in or to any Airports Authority electronic communications system, or to any component of such system (e.g., hardware, software, protocols), without the express approval of the System Custodian, or his/her designee, and only authorized personnel may make modifications.

2) Users are required to report any damaged or defective electronic communications system or system component immediately to their supervisor and the System Custodian.

3) The term "*modifications*" includes, but is not limited to:
   - Installing/moving
   - Adding/substituting

- Testing/maintaining
- Modifying/updating
- Copying/removing/deleting
- Other unauthorized changes

6.2 Information Security

The Airports Authority's electronic communications systems are used to communicate a variety of sensitive information, including proprietary, financial, commercial, human resource, legal, and other information that may be Confidential Information. The Airports Authority is responsible for establishing and enforcing policies and standards to protect the security of information communicated through its electronic communications systems. To that end, the following applies:

1) No information may be *processed* within an electronic communications system by any person without authorization obtained as provided in Section 5.0. Only persons authorized to engage in processing may do so, and such persons may only perform the processing activities or functions that are within their authorization.

2) Users are required to take reasonable steps to ensure information security at all times. Users should report security breaches immediately to their supervisor and the System Custodian.

3) The term "*processed*" includes, but is not limited to:
    - Creating/entering
    - Revising/modifying/substituting
    - Copying/moving/deleting
    - Transmitting/receiving
    - Uploading/downloading
    - Accessing/viewing/disclosing
    - Protecting/exposing to risk
    - Encrypting/decrypting

6.3 Information Security Practices

Users who process Confidential Information within any Electronic Communications System must exercise care to ensure that such information is protected from unauthorized or inadvertent disclosure (i.e., beyond those individuals with a Need to Know). Examples of good security practices include the following:

1) Telephone, Voice mail, and Paging Systems: Users should place and receive calls to reduce unauthorized listening. Users who need to communicate Confidential Information should avoid using speakerphones for such messages. Users should leave messages only for recipients with a clear Need to Know.

2) Email Systems: Users must observe the highest standard of care when processing Confidential Information that is conveyed through, or stored in, the Airports

Authority's email systems, because the email systems are not necessarily sufficient themselves to protect this type of information from unauthorized disclosure. In addition, Users are responsible for taking the following steps to ensure the security of emails:

a) Always keep passwords confidential and never share them with others.

b) Always close access to email accounts and lock laptop/desktop before leaving unattended.

External email can be encrypted by typing [send secure] (exactly as shown) in the Subject line of an email message.

Where possible, Users should contact via telephone a recipient to whom Confidential Information is to be sent to ensure that the recipient is authorized to receive such information.

When a User sends a message via email, a copy of the message is automatically stored on Airports Authority email servers and this message may also be stored on non-Airports Authority servers, when the message was sent or forwarded outside of the Airports Authority. Thus, in the case of emails sent outside the Airports Authority, access to the email message may be available to persons completely outside of the control (or even the knowledge) of the Airports Authority. Because of this lack of control over the disclosure of such information, Users should refrain from using (or allowing others to use) email as a method of communicating Confidential Information to persons outside of the Airport Authority.

3) Email Addresses: Users are advised to use their Airports Authority-provided email addresses cautiously, because external sources may send "junk email messages" (e.g., advertisements, commercial solicitations, political statements) to a User's address. More problematic is the situation where a User posts (or allows a third party to post) the User's email address on a website. In this case, the email address may be added to junk or nuisance mail lists for use and for sale.

4) Facsimile (Fax) Systems: Some fax systems (e.g., e-fax), upon receipt of a fax message, convert it into an email message and utilize email for delivery. Thus, all the above comments on email apply to fax messages sent to such systems.

Where Confidential Information is to be transmitted by a fax system, the User must confirm in advance that the recipient does not use a system that converts fax messages to email. If a recipient does use such a system, the User should not transmit such information via the fax system. If the recipient's system does not convert fax messages to email, the User must nonetheless call the intended recipient and notify him/her in advance of sending the message, unless the User knows that the recipient is expecting the transmission and is standing by waiting for it. The User should use a cover sheet that clearly identifies the intended recipient, that states the information to follow is private and/or confidential, and intended only for the recipient, and that notifies the recipient what to do if he/she is not the person to whom the User intended to fax the information.

If a User sends a message via e-fax, it is possible that a copy of the message will be stored on the recipient's computer. In turn, this means that the message is available for disclosure and use by persons completely outside of the control (or even the knowledge) of the Airports Authority. Because of this lack of control over the disclosure of such information, Users should refrain from using (or allowing others to use) the e-fax method of communicating Confidential Information unless precautions are taken to ensure that such information is fully protected.

5) Unified Communications System: Instant messaging (IM) and video conferencing capabilities enable real-time, multi-client collaborative communications, allowing team members to simultaneously work and communicate.

   IM conversations, instant messages, video conferences and video sessions are not logged, retained or archived on any of the Airports Authority systems for any amount of time. As a result, neither the IM nor the video conferencing is to be used by Users in the course of reaching or documenting Airports Authority business decisions or other actions, including without limitation Airports Authority authorizations, approvals, or required reviews.

7.0 Privacy and Confidentiality

7.1 General

When conducting Airports Authority business, Users must exercise care communicating Confidential Information. Users are responsible for safeguarding such information and protecting against its unauthorized or inadvertent disclosure (e.g., to those without a Need to Know). If a User inadvertently receives a message containing Confidential Information, he/she should forego reading it and notify his/her supervisor at once.

7.2 Electronic Monitoring

Each electronic communications system the Airports Authority makes available to Users, including the system's associated software and equipment, is the property of the Airports Authority. Any information produced using, or processed in or through, any such system by Users (including as part of communications conveyed by Users through, or stored, in a system) is the property of the Airports Authority. In addition, any communication made or received by Users while using any such system is subject to being monitored, retrieved, and /or recovered by the Authority.

The Airports Authority reserves the right to employ reasonable means to limit the use of its electronic communications systems to Users possessing the requisite authorizations to use the systems, and to ensure that the use of these systems by Users is consistent with this Directive. For example, the Airports Authority uses "Websense" internet monitoring to ensure that system use is consistent with this directive. The Airports Authority also reserves the right, in its sole discretion, to monitor and review the use of any of its electronic communications systems (e.g., email, telephone) by any User. In exercising this discretion, the Airports Authority will endeavor to engage in such monitoring or review when it is reasonably related to a legitimate Airports Authority interest, including without limitation, when a User is reasonably suspected of engaging, or having engaged, in a Prohibited Use (see Section 10.3) or in a Personal Use (see Section 10.2) that is excessive or that otherwise interferes with Airports Authority business. The Airports Authority will take reasonable steps to undertake such monitoring or review in a manner that is no more intrusive than necessary to achieve or protect the Airports Authority's interest to which the monitoring or review is related (e.g., to determine whether a User has engaged in a Prohibited Use or has exceeded the limits regarding Personal Use).

7.3 Requests for Records

The Airports Authority's Freedom of Information Policy governs all requests for disclosure of Airports Authority records, which can include "records" produced via an Airports Authority electronic communications system. In general, Users should regard all communications, including email and phone messages that are conveyed through or stored in a system, as subject to disclosure under the Freedom of Information Policy, as well as subject to discovery and use in litigation involving the Airports Authority. Users should note that communications may still be accessed and/or retrieved after having been "deleted" from most systems. (See Section 8.0, Email Retention and Destruction below.)

8.0 Email Retention and Destruction

The Airports Authority's email system is not designed to be a long-term recordkeeping system for Users or for the Airports Authority. All email messages that pass through the Airports Authority's email system are subject to the following policy regarding their location, retention and destruction.

8.1 Location of Email Messages

1) Email messages may only reside in one or more of the following locations:
   - In mailboxes which are part of the Microsoft Exchange System (Exchange System), including Outlook Inbox, Sent Items, and Deleted Items folders, and folders created by Users;
   - In the Enterprise Vault which is part of the Archive System (all emails over 30 days old or more than 3MB in size are automatically archived to the Enterprise Vault);
   - On IT Global backup tapes which are part of the Email Backup System (all emails on the Airports Authority's email system are backed up nightly); and
   - In the Email Journal System.

2) Email messages may not reside in any of the following locations:
   - On a User's local or attach storage drive, except as allowed under Paragraph 8.2 (4)(b) relating to emails approaching the end of their five-year retention period;
   - On a back-up of a User's local drives created by the User;
   - On a personal or assigned space on a User's home or other network drive; or
   - On a User's personal storage device (e.g., USB thumb drive, CD or DVD, local disk).

8.2 Retention and Destruction of Email Messages

1) "Journaling" refers to a process that captures a copy of Airports Authority's emails while in transit, and stores them in the E-Journal System. This process occurs independently of, and requires no action by, email Users. Journaling guarantees the authenticity of the email messages that are stored in the E-Journal System, and allows the Airports Authority to retrieve specific emails from that system by name, date, subject matter and/or other identifiers for litigation and other Airports Authority purposes.

2) Journaling of email messages that originated from and received through the Microsoft Exchange System became effective April 14, 2009. The Airports Authority will retain journaled emails for five years, at which time they will be destroyed. For example, emails sent or received on May 2, 2009 will be retained in the Airports Authority electronic Archives System through May 1, 2014, and may be retrieved via Email Journal System up to that date. On May 2, 2014, these messages will be destroyed.

3) Only the Airports Authority General Counsel and the Secretary of Board, or persons designated by these officers, will have access to emails stored in the E-Journal System.

4) Other than through the Journaling system, all emails in the Airports Authority's email system will be retained in three systems: the Exchange System, the Archive System, or the Email Backup System.

   a) Exchange System: Emails produced and received by Users will be retained in this system, on Exchange Servers, for 30 days following their production or receipt, at which point they will be routinely moved to the Archive System. Also, emails that exceed 3MB in size will, upon production or arrival, be immediately moved to the Archive System.

   b) Archive System: Archiving is a process that moves email messages to a secondary storage location. This location, in the Airports Authority Archive System, is called the "Enterprise Vault". Archiving is done to maintain the responsiveness of the Exchange System. Archiving is performed automatically, without need of any User action. Users have access to their own emails that have been archived in the Enterprise Vault, and have the ability to conduct searches of these archived emails and to view, print, forward, or reply to them. However, Users do not have the ability to delete archived emails, or to access the emails of other Users that are in the Enterprise Vault.

      The Airports Authority will retain emails that have been archived in the Enterprise Vault for a period of five years from the date an email is moved to the Archive System. Users may not, and do not, have the ability to archive emails to Outlook archive (.pst) files. Users who need to keep information from an email that is nearing its five-year archive life should print a hard copy of the email.

   c) Email Backup System: The Office of Technology regularly backs up email messages onto tapes. This includes email messages in the Exchange System and in the Archive System. The Airports Authority will delete copies of backed up email messages six months after the date of their backup onto a tape.

For additional information concerning email retention, Users should contact their supervisor or the Office of Technology.

9.0 Supervisor Responsibilities

When a User has been given access to Airports Authority electronic communications systems to perform Airports Authority work, the User's supervisor must instruct users in the proper use of the Airports Authority's equipment and services. In addition, the Supervisor should give the new user a copy of this Directive.

Periodically, supervisors need to remind Users that Airports Authority electronic communications systems and services are intended for Airports Authority business, and that personal use while not prohibited, may not become excessive or interfere with Airports Authority business, and must be otherwise in accordance with Section 10.0. Moreover, other Airports Authority policies (e.g., policies on harassment, discrimination, outside employment, ethics and conflict of interest) apply to electronic communications systems. If supervisors observe Users using electronic equipment inappropriately, they may counsel the Users or propose disciplinary actions. The supervisor's action would depend on the impact of the inappropriate behavior on operational effectiveness, and the Airports Authority's Conduct and Discipline Directive. (Supervisors should contact the Labor and Employee Relations Department for further information).

10.0 User Responsibilities and Obligations

All Users are subject to, and must adhere to, the following responsibilities and obligations when using any Airports Authority electronic communications system.

10.1 Business Use

When using Airports Authority electronic communications systems for Airports Authority business, Users are expected to:

1) Ensure that communications containing Confidential Information are not transmitted over "open" message systems, including email, voicemail, instant messaging, and other electronic communications systems.

2) Disclose communications containing Confidential Information only to those who have a Need to Know or are otherwise authorized to receive the information, and to protect such communications from inadvertent loss or destruction.

3) Notify Airports Authority management of known or suspected improper use of any electronic communications system, including inadvertent sending, reading, or receiving of another User's communications.

4) Secure official records in accordance with Airports Authority policies and procedures.

5) Process Airports Authority information only when authorized and only to the extent authorized.

10.2 Personal Use

Users may use an Airports Authority electronic communications system for personal use (i.e., a use that does not arise from and is not related to any Airports Authority business), subject to the following prohibitions and limitations:

1) Radio transmissions of a personal nature are prohibited over Airports Authority two-way radio systems.

2) Users may not routinely or excessively engage in the personal use of any electronic communications system during work hours or while using Airports Authority equipment.

3) Personal use of any electronic communications system may not interfere with the performance of any Airports Authority business, must be limited so that the duration and frequency are not excessive, and must always yield to Airports Authority business.

4) If a personal use of any electronic communications system results in costs to the Airports Authority (e.g., long distance phone calls or fax message), the User must pay for the costs.

10.3 Prohibited Use

Users are prohibited from using any Airports Authority electronic communications system in the following ways:

1) In a way that interferes with Airports Authority business.

2) To gain access to a system which the User is not authorized to use, or to use a system or its components in an unauthorized manner.

3) To allow or assist another person to gain unauthorized access to a system or to use a system which the person is not authorized to use.

4) To send communications that are in violation of law, that are contrary to Airports Authority policy or that would form the basis for disciplinary action against the User (e.g., defamatory statements, harassing or discriminatory comments or images, "chain" letters, solicitations, gambling, conflicts of interest, or violations of another person's privacy or confidentiality).

5) To send communications with illegal, offensive, abusive, threatening, harassing, disruptive or otherwise inappropriate language, including sending or intentionally receiving sexually oriented messages or images and humor.

6) To disclose Confidential Information (including passwords) contained in a message communicated by an Airports Authority system to any person without a Need to Know, or to assist or allow another person to disclose such information to a person without a Need to Know, unless expressly authorized to do so.

7) To undertake an activity or conduct a business for personal gain or profit, whether on behalf of the User or another person or business (e.g., selling, purchasing, copying, faxing, and printing).

8) To send, access, receive or obtain material or information that is not required for or related to Airports Authority business (except as pertained in paragraph 10.2), that is pornographic, or promotes gambling, or the sending, accessing, receiving or obtaining of which through an Airports Authority electronic communications system is prohibited by law or Airports Authority policy.

9) To fail to safeguard and protect Airports Authority property (e.g., hardware, software, passwords, information, etc.), including the making of backup copies of existing files when and as required.

10) To knowingly circumvent or attempt to circumvent any devices, methods, or procedures of the Airports Authority that are intended to limit or regulate access to or use of Airports Authority electronic communications system and information (e.g., "Websense").

11) In any way that facilitates, or is associated in any manner with, conduct that is prohibited by the Conduct and Disciplinary Directive, Airports Authority policy, or Airports Authority regulations.

11.0 Disciplinary Action

Airports Authority employees, including employees who are Users, who engage in a use of an Airports Authority electronic communications system that is inconsistent with this Directive, including without limitation any use that is prohibited under Section 10.0 are subject to disciplinary action. The Airports Authority reserves the right to seek or take appropriate action against any person who is not an employee, including non-employee Users, for actions that are prohibited by or otherwise inconsistent with this Directive, a contract to which the Airports Authority is party, or the law.

12.0 Periodic Directive Review

This Directive will be reviewed periodically to ensure that it complies with all applicable law and Airports Authority policies. Questions regarding this Directive should be directed to the Office of Technology.

Acknowledgement:

I, ________________________, have read and understand the conditions outlined in this Electronic Communications Systems Directive, and I agree to be bound by its terms.

____

(Employee/Contractor signature) (Date)

____

(Employee/Contractor printed name)

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY
INFORMATION SECURITY AGREEMENT

I, ______________________________ (type name) (hereinafter "User"), agree to take all reasonable precautions assure that Airports Authority confidential or private information, including information that has been entrusted to the Airports Authority by third parties, will not be disclosed to unauthorized persons. At the end of my employment or contract with the Airports Authority, I agree to return to the Airports Authority all information to which I have had access as a result of my position with the Airports Authority. I understand that I am not authorized to use this information for my own purposes or to provide this information to third parties without the express written consent of the Airports Authority manager who is the designated information owner.

I have access to a copy of the Airports Authority's Electronic Communication Policy and Information Security Standards (see page 3) , I have read and understand the information contained therein, and I understand how it affects my job. As a condition of continued employment/contract with the Airports Authority, I agree to abide by the policies and requirements found in those policies. I understand that non-compliance will be cause for disciplinary action up to and including system privilege revocation, dismissal from the Airports Authority, and criminal and/or civil penalties, where appropriate.

I agree to choose a difficult-to-guess password as described in the Airports Authority's Electronic Communications Policy and Information Security Standards. I also agree to refrain from sharing any passwords with anyone, and to refrain from writing any password down unless it has been transformed in an unrecognizable way.

I also agree to promptly report all violations or suspected violations of information security policies to the Information Security Group via The Technology Service Desk at 703-417-tech (8324) (select option 1) or techWorks@mwaa.com

Date Signed: ______________________________

Authority Login Name: ______________________________

Authority MA Department: ______________________________

Signature: ______________________________

MWAA IT Security Policy start on the next page

Also the IT Security Policy call is found on under Enterprise: MA-600: Information Security Policies Folder in Livelink.

INFORMATION SECURITY STANDARDS

FOREWORD

These Information Security Standards (ISS) define the Metropolitan Washington Airports Authority (the Authority) standards governing the set up and operation of all Authority owned data processing systems and associated networks. It is issued under the authority of the Authority Electronic Communications Systems Policy (GA-005), section 4.b.

06/16/2014

Goutam Kundu
Vice President for Technology

Date

Standard Operating Procedure (SOP):
Information Security Standards

Metropolitan Washington Airports Authority
1 Aviation Circle
Washington, DC 20001-6000

June 16, 2014

techWORKS
Office of Technology

Metropolitan Washington Airports Authority – Office of Technology Standard Operating Procedure			
Title	**ID Number**	**Effective Date**	**End-of-Life Date**
Information Security Standards	SEC-POL-IS001.01	6/16/14	

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1.0 Introduction

1.1 Point(s) of Contact

Goutam Kundu, Vice President Office of Technology, (703) 417-8762.
Miguel Ramos, Acting IT Security Program Manager, (703) 417-8389.
Jeffrey Carswell, MA-600 Technical Writer, (703) 417-1070
Technology Service Desk, (703) 417-TECH (8324).

1.2 Related Documents

Airports Authority Electronic Communications System Policy
Office of Technology Standards (MA600)
Office of Technology Standards (MA600) – Attachment A
Office of Technology Standards (MA600) – Attachment B

2.0 Purpose

The Metropolitan Washington Airports Authority (Airports Authority) provides electronic communication equipment and systems to enable Users to accomplish the Airports Authority's mission and to promote the efficient conduct of Airports Authority business. It is consistent with the Airports Authority's commitment to Safety, Security and Risk Reduction that standards be identified for the establishment, maintenance and usage of such systems in a manner that promotes Information Security.

This document is subordinate to, and is to be interpreted consistent with, the Airports Authority Electronic Communications Systems Policy (IT-001B). It is issued under the authority of the Airports Authority Electronic Communications Systems Policy, section 4.b. and will be periodically reviewed, maintained and updated by the Office of Information and Telecommunications Systems.

3.0 Definitions

3.1 Authorized Personnel: See the Airports Authority Electronic Communications Systems Policy (IT-001B).

3.2 Confidential Information: See the Airports Authority Electronic Communications Systems Policy (IT-001B).

3.3 Information Security Group: A group within the Office of Information and Telecommunications Systems designated to monitor and improve the Airports Authority's Information Security posture.

3.4 Network Architect: The person within the Office of Information and Telecommunications Systems designated as responsible for the design of the Airports Authority Data Network.

3.5 Owner: See the Airports Authority Electronic Communications Systems Policy (IT-001B).

3.6 Private Information: See the Airports Authority Electronic Communications Systems Policy (IT-001B).

3.7 Policy: See the Airports Authority Electronic Communications Systems Policy (IT-001B).

3.8 System Custodian: See the Airports Authority Electronic Communications Systems Policy (IT-001B).

3. 8. 1 Database Custodian: A System Custodian who is tasked with the technical support of one or more databases.

3. 8. 2 Network Custodian: A System Custodian who is tasked with the technical support of network equipment and connections.

3. 8. 3 Server Custodian: A System Custodian who is tasked with the technical support of one or more servers.

3. 8. 4 Workstation Custodian: A System Custodian who is tasked with the technical support of one or more workstations and related peripheral devices.

3.9 User: See the Airports Authority Electronic Communications Systems Policy (IT-001B).

4.0 Firewall Standard

4.1 Firewall configuration standard.

4. 1. 1 All firewall configurations will be tested and approved by the assigned Network Custodian.

4. 1. 2 The Network Custodian will update and maintain a network diagram with all connections into their assigned network represented and provide an updated copy to the Network Architect and to the Information Security Group within MA-600.

4. 1. 3 An enterprise firewall must be maintained at each Internet connection, between any demilitarized zone (DMZ) and the internal network zone and between network zones as determined by the Information Security Group.

4. 1. 4 The following individuals and/or groups have responsibilities for logical management of the listed network components:

Component	Responsibility
Firewalls	Network Custodian
Routers	Network Custodian
Switches	Network Custodian
Wireless Access Points	Network Custodian
VPN Devices	Network Custodian
IP Range Assignments	MA-640 (Network Architect)

Documentation of the approved settings of each firewall must be maintained by the Network Custodian.

4. 1. 5 Each protocol other than hypertext transfer protocol (HTTP), secure sockets layer (SSL), secure shell (SSH), hypertext transfer protocol over secure socket layer (HTTPS), transport layer security (TLS) and virtual private network (VPN) will be justified and documented by the Network Custodian.

4. 1. 6 Each protocol allowed, such as file transfer protocol (FTP), will be justified and documented by the Network Custodian with appropriate compensating controls.

4. 1. 7 Each Airports Authority router will be configured according to the base rule set approved by the Network Custodian.

4. 1. 8 The Information Security Group will perform a quarterly review of firewall and router configuration files and compare to approved settings.

5.0 Installation Standard for New Systems

5.1 All vendor-supplied default passwords and accounts must be changed by the System Custodian as part of the system installation.

5. 1. 1 For wireless environments, change wireless vendor defaults, including, but not limited to, wired equivalent privacy (WEP) keys, default service set identifier (SSID), passwords, and SNMP community strings. Disable SSID broadcasts. Enable protected access technology for encryption and authentication according to current industry best practices.

5.2 New systems will be installed by the System Custodian according to industry best practices.

5. 2. 1 All unnecessary services and protocols will be disabled.

5. 2. 2 System security parameters will be configured to prevent misuse.

5. 2. 3 All unnecessary functionality, such as scripts, drivers, features, subsystems, file systems and web servers will be removed.

5. 2. 4 Each server will have only one primary function (for example, web server, database server, DNS, etc.).

5.3 Administrative access to systems across network boundaries will only be allowed by encrypted non-console services such as SSH, VPN or SSL.

5.4 Warning banners will be displayed as specified in the Airports Authority IT Policy – Banners as published on the Airports Authority's Livelink site.

5.5 Screensavers that require re-verification will be enabled with no more than a 15 minute wait period.

6.0 Data Classification Standard

6.1 Any data containing information such as credit card data, social security numbers, performance issues or medical files is classified as private information.

6. 1. 1 Private information must be protected by the information owner with the appropriate technical, administrative and physical safeguards.

6. 1. 2 Private information may only be shared with authorized personnel, as determined by the information owner.

6. 1. 3 Unauthorized disclosure or access to private information must be reported immediately to the immediate supervisor and/or information owner.

6. 1. 4 Private information may not be copied, moved, or stored onto local hard drives or removable electronic media without specific authorization by the information owner.

6.2 Any data containing information that is intended for Airports Authority business purposes only, such as system information, pending procurement matters, Airports Authority credit card data or prospective bond issues is classified as confidential.

6. 2. 1 Confidential information must be protected by the information owner with the appropriate technical, administrative and physical safeguards.

6. 2. 2 Confidential information may only be shared with Airports Authority employees and/or contractors on a business need-to-know basis, as determined by the information owner.

6. 2. 3 Unauthorized disclosure or access to confidential information must be reported immediately to the immediate supervisor and/or information owner.

7.0 Data Retention Standard

7.1 The System Owner will develop and assure implementation of data retention standards for information contained within their systems.

7.2 Data retention standards will be developed with full consideration to legal, regulatory and business requirements for retention of subject data.

7.3 Data retention standards will include provisions for disposal of data when no longer needed for legal, regulatory or business requirements.

7.4 Where legal, regulatory or business requirements dictate; a manual or automated process to remove data exceeding the applicable data retention standard will be developed.

8.0 Encryption Standard

8.1 Strong cryptography (as defined in FIPS 140-2) and security protocols will be used when transmitting private or confidential data such as passwords, pending procurement matters or credit card data.

8. 1. 1 When entering or transmitting private or confidential data such as passwords, pending procurement matters or credit card data via an Internet browser, you must ensure that the address begins with https:// and that the secure lock symbol is visible in your browser window.

8. 1. 2 Users must never transmit private or confidential data such as passwords, pending procurement matters or credit card data over an open, public network without encryption through security protocols such as secure sockets layer (SSLv3/TLS) and Internet protocol security (IPSEC).

8. 1. 3 Users must never send private or confidential data such as passwords, pending procurement matters or credit card data via unencrypted email or other unsecured methods.

8. 1. 4 Users must assure that the destination URL and/or IP number used in transmission of encrypted data is legitimate.

9.0 Vulnerability Management Standard

9.1 Anti-malware software will be deployed and maintained by the System Custodian on all systems commonly affected by viruses and other forms of malware.

9. 1. 1 The software must be capable of detecting, removing and protecting against viruses and other forms of malicious software, including spyware and adware.

9.2 The System Custodian will ensure, no less frequently than weekly, that all anti-malware mechanisms are current, actively running and capable of generating audit logs.

10.0 Patch Management Standard

10.1 The System Custodian will ensure, no less frequently than monthly, that all system components and software have the latest vendor-supplied security patches installed.

10.2 The System Custodian will maintain a method to identify newly discovered security vulnerabilities for Airports Authority system components and software.

10.3 All software development will follow a formal software development life cycle, implementing information security throughout the process.

10.4 Separate development, test, and production environments will be maintained.

10.5 There will be a separation of duties between production environments and others.

10.6 There must be a documented change control process for all production hardware and software changes maintained by the System Custodian.

10.7 The web application development teams will follow the Open Web Application Security Project guidelines during custom application development.

10.8 All web-facing applications must be protected against known attacks by one of the following methods: (1) independent validation of all custom application code or (2) installing an application layer firewall in front of the web-facing application.

11.0 Access Control Standard

11.1 Access to system components must be restricted on a business need-to-know basis

11.2 For usage of critical user-facing technologies, each user must abide by the standard/policy governing proper use, including:

11. 2. 1 Explicit management approval (See Electronic Communications Systems Policy).

11. 2. 2 Authentication/authorization for use of the technology as established by the System Custodian.

11. 2. 3 Acceptable uses of the technologies (See Electronic Communications Systems Policy).

11. 2. 4 Use only products from the company-approved list maintained by the System Custodian.

11. 2. 5 Automatic disconnect of sessions after a specific period of inactivity set by the System Custodian.

11. 2. 6 Activation of access for vendors only when needed, with immediate deactivation after use.

12.0 Password Standard

12.1 Username and password will be unique to an individual and not shared unless authorized by the System Custodian/Information Owner and the Information Security Group.

12.2 Where passwords are used, each System Custodian will maintain and enforce a password standard that meets or exceeds industry best practices and the Airports Authority IT Policy – Passwords as published on the Airports Authority's Livelink site.

12.3 To access the Airports Authority network remotely, each user must have two forms of authentication (such as a password and a VPN certificate).

12.4 Passwords must be encrypted during transmission and storage on all system components.

12.5 The System Custodian and/or Owner will ensure proper user authentication and password management on all system components as follows:

- 12. 5. 1 Control addition, deletion, and modification of user IDs, credentials, and other identifier objects.
- 12. 5. 2 Verify user identity before performing password resets.
- 12. 5. 3 Set network first-time passwords to a unique value for each user and change immediately after the first use.
- 12. 5. 4 Immediately revoke access for any terminated users.
- 12. 5. 5 Remove inactive user accounts at least every 90 days.
- 12. 5. 6 Enable accounts used by vendors for remote maintenance only during the time period needed.
- 12. 5. 7 Communicate password procedures and policies to all users.
- 12. 5. 8 Do not use group, shared, or generic accounts and passwords, unless authorized by the System Custodian/Information Owner and the Information Security Group.
- 12. 5. 9 Change user passwords at least every 90 days.
- 12. 5. 10 Change administrative passwords at least every 60 days.
- 12. 5. 11 Require a minimum password length of at least eight characters.
- 12. 5. 12 Use passwords containing both numeric and alphabetic characters.
- 12. 5. 13 Do not allow an individual to submit a new password that is the same as any of the last four passwords he or she has used.
- 12. 5. 14 Limit repeated access attempts by locking out the user ID after not more than six attempts.
- 12. 5. 15 Set the lockout duration to no less than thirty minutes or until an administrator enables the user ID.
- 12. 5. 16 If a session has been idle for more than 15 minutes, require the user to re-enter the password to re-activate the terminal.
- 12. 5. 17 Authenticate all access to any database containing private or confidential data. This includes access by applications, administrators, and all other users.

13.0 Physical Security Standard

13.1 Facility entry controls will be implemented to limit and monitor physical access to areas containing private or confidential information.

13. 1. 1 Cameras may be implemented to monitor such areas. Collected data may be monitored and must be stored for a minimum of seven days.

13. 1. 2 Publicly accessible network jacks (other than those intended for guest usage) must require additional authentication before permitting any access.

13. 1. 3 Access to wireless access points and wireless gateways must be restricted.

13. 1. 4 Access to wireless handheld devices with access to private or confidential data must be restricted.

13.2 Access to areas where private or confidential information is stored or transmitted must be restricted.

13.3 Visitors entering areas where private or confidential data is processed or maintained:

13. 3. 1 Must be authorized by the system custodian.

13. 3. 2 Must be escorted or given a temporary physical token (for example, a badge or access device) that expires and that identifies the visitors as non-employees.

1.1.1.1 If a temporary physical token is given, it must be surrendered before leaving the facility or at the date of expiration.

13.4 A visitor's log that maintains a physical audit trail of visitor activity must be maintained. Collected data must be retained for a minimum of three months.

13.5 Media back-ups must be stored in a secure location, preferably off-site.

13.6 All paper and electronic media that contains private or confidential data must be physically secured.

13.7 The internal and external distribution of any kind of media that contains private or confidential data must be strictly controlled.

13. 7. 1 Mark the media as private or confidential.

13. 7. 2 Transfer the media by secured courier or other delivery method that can be accurately tracked.

13.8 Management must approve any and all media that is moved from a secured area, especially when media is distributed to individuals.

13.9 The storage and accessibility of media that contains private or confidential data must be strictly controlled.

13. 9. 1 All such media must be properly inventoried and securely stored.

13.10 Once the decision to destroy media containing private or confidential data has been made, destruction must proceed as follows:

13. 10. 1 Cross-cut shred, incinerate or pulp hardcopy materials.

13. 10. 2 Purge, degauss, shred or otherwise destroy electronic media so that private or confidential data cannot be reconstructed.

14.0 Security Monitoring Standard

14.1 The System Custodian will ensure that all access to system components are linked to each individual user for logging purposes.

14.2 The System Custodian will ensure that automated audit trails for all system components are implemented to reconstruct the following events:

14. 2. 1 All individual user accesses to private or confidential data (through the application or otherwise).

14. 2. 2 All actions taken by any individual with root or administrative privileges.

14. 2. 3 Access to audit trails of financial systems or other systems primarily used to process and store private or confidential data.

14. 2. 4 Invalid logical access attempts.

14. 2. 5 Use of application level identification and authentication mechanisms.

14.3 The System Custodian will ensure that all audit trail entries record at least the following parameters for each event:

14. 3. 1 User identification.

14. 3. 2 Type of event.

14. 3. 3 Date and time.

14. 3. 4 Success or failure indication.

14. 3. 5 Origination of event.

14. 3. 6 Identity or name of affected data, system component, or resource.

14.4 The System Custodian will ensure that all critical system clocks and times are synchronized.

14.5 The System Custodian will ensure that all audit trails are secured so that they cannot be altered, and:

14. 5. 1 Limit viewing of audit trails to those with a job-related need.

14. 5. 2 Protect audit trail files from unauthorized modifications.

14. 5. 3 Promptly back-up audit trail files to a centralized log server or media that is difficult to alter.

14. 5. 4 Copy logs for wireless networks onto a log server on the internal LAN.

14. 5. 5 Use file integrity monitoring and change detection software on logs to ensure that existing log data cannot be changed without generating alerts (although new data being added should not cause an alert) if a centralized log server is not being used.

14.6 The System Custodian will review logs for all system components at least daily or implement an automated log reviewing function that will generate alerts for unusual events. Log reviews must include those servers that perform security functions like intrusion detection system (IDS) and authentication, authorization, and accounting protocol servers (for example, RADIUS).

14.7 Audit trail history must be retained for at least two years, with a minimum of three months online availability.

14.8 The System Custodian will monitor and analyze security alerts and information and distribute to appropriate personnel (including the Information Security Group).

15.0 Security Testing Standard

15.1 The Information Security Group will test security controls, limitations, network connections, and restrictions annually to assure the ability to adequately identify and to stop any unauthorized access attempts.

15.2 The Information Security Group will test wireless access security controls, limitations, network connections, and restrictions annually to assure the ability to adequately identify and to stop any unauthorized access attempts.

15.3 The Information Security Group or a designated third party will run periodic internal and external network vulnerability scans against non-PCI environments.

15.4 An approved scanning vendor certified by the PCI Security Standards Council will run internal and external network vulnerability scans against PCI environments quarterly and after any significant change in the network (such as new system component installations, changes in network topology, firewall rule modifications, product upgrades).

15.5 An approved scanning vendor certified by the PCI Security Standards Council will perform internal and external penetration testing against PCI environments once a year and after any significant infrastructure or application upgrade or modification (such as an operating system upgrade, a sub-network added to the environment, or a web server added to the environment).

15.6 The Information Security Group or a designated third party will perform periodic penetration testing against non-PCI environments. These penetration tests must include the following:

15. 6. 1 Network-layer penetration tests.

15. 6. 2 Application-layer penetration tests.

15.7 The Information Security Group will use network intrusion detection systems and/or host-based intrusion detection systems and/or intrusion prevention systems to monitor network traffic and alert personnel to suspected compromises, malicious activities or policy violations. The Information Security Group will ensure that all intrusion detection and prevention engines are up-to-date.

16.0 Incident Response Standard

16.1 Members of the Computer Incident Response Team are as follows:

16. 1. 1 The Information Security Group.

16. 1. 2 MA-610 Managers.

16. 1. 3 All System Custodians.

16. 1. 4 Others, as needed.

16.2 Airports Authority system users shall notify the Computer Incident Response Team of all potential security incidents, including but not limited to:

16. 2. 1 Unauthorized use; (sending SPAM, chain e-mails or threatening e-mails, planting viruses, conducting network-level probes/scans, exceeding authorization level, etc.).

16. 2. 2 Theft of data.

16. 2. 3 Unauthorized alteration or deletion of data.

16. 2. 4 Denial of service and/or system failure.

16. 2. 5 Unsuccessful access attempts repeated in excess of defined thresholds.

16. 2. 6 Unauthorized access that is manifested:

1.1.1.2 Internally (by an employee, customer, vendor or other on company property).

1.1.1.3 Externally (by an employee, customer, vendor and all others outside company property).

16.3 The Computer Incident Response Team shall establish procedures to:

16. 3. 1 Recover systems or services as quickly as possible.

16. 3. 2 Analyze and identify the cause of the incident.

1.1.1.4 Allowing only clearly identified and authorized staff to access live data and systems.

1.1.1.5 Document in detail all emergency actions.

1.1.1.6 Report to management all emergency actions.

1.1.1.7 Confirm the integrity of business systems and security controls with minimal delay.

16. 3. 3 Plan and implement remedies to prevent recurrence.

16. 3. 4 Collect audit trails and/or evidence.

1.1.1.8 To provide evidence for investigation, prosecution, and disciplinary actions, certain information should be captured whenever it is suspected that computer or network related crime or abuse has taken place.

1.1.1.9 The relevant information should be securely stored off-line until such time as it is determined that the Airports Authority will not pursue legal action or otherwise use the information.

1.1.1.10 The information to be immediately collected includes the system logs, application audit trails, other indications of the current system states, as well as copies of all potentially involved files.

16. 3. 5 Communicate with business users and others affected by or involved with the recovery from the incident.

17.0 Security Awareness Standard

17.1 All Airports Authority users will attend at least one hour of Information Security training each year.

17.2 Security related articles/inserts will appear in each monthly issue of *IT's NEWS*

18.0 Vendor Management Standard

18.1 Contracting Officers and Contracting Officers' Technical Representatives will exercise due diligence in selecting IT outsourcing service providers.

18.2 Contracting Officers and Contracting Officers' Technical Representatives will require IT outsourcing service providers by contract to implement appropriate measures designed to meet the objectives below:

18. 2. 1 Ensure the security and confidentiality of private and confidential information.

18. 2. 2 Protect against any anticipated threats or hazards to the security or integrity of such information.

18. 2. 3 Protect against unauthorized access to or use of such information that could result in substantial harm or inconvenience to any entity.

18. 2. 4 Dispose of private and confidential information in a secure manner.

18. 2. 5 Immediately inform the Airports Authority in the event of a security breach involving private or confidential information.

18.3 Contracting Officers' Technical Representatives will monitor IT outsourcing service providers to confirm that they have satisfied the obligations described above. As part of this monitoring, Contracting Officers and Contracting Officers' Technical Representatives will review documents that may include, but are not limited to, contracts, audits, and summaries of test results or other documents. In addition, Contracting Officers and Contracting Officers' Technical Representatives will request a SAS 70 Part II or equivalent third-party assessment of significant IT outsourcing service providers. These reviews will take place on at least an annual basis for existing vendors. For new vendors, these documents will be reviewed prior to signing any contract.

19.0 Configuration Management Standard

19.1 System Custodian will maintain an inventory of information system components (hardware and software) under their control that:

19. 1. 1 Ensure the security and confidentiality of private and confidential information

19. 1. 2 Accurately reflects the current information system(s);

19. 1. 3 Is consistent with the authorized boundary of the information system(s);

19. 1. 4 Is at a level of granularity necessary for tracking and reporting

20.0 Availability Management Standard

20.1 System Custodian will take all reasonable steps to assure system availability during required hours of operation. Steps shall include:

20. 1. 1 Providing adequate HVAC for equipment;

20. 1. 2 Providing adequate power supply and power conditioning for equipment;

20. 1. 3 Performing periodic backups of all central production servers;

20. 1. 4 Performing periodic restoration testing of central production servers;

20.2 Review, no less frequently than annually, the system architecture (redundant hardware, data paths, and power) for appropriateness.

Office of Technology Policy:
Patch Management Policy

Metropolitan Washington Airports Authority
1 Aviation Circle
Washington, DC 20001-6000

January 28, 2015

techWORKS
Office of Technology

Metropolitan Washington Airports Authority – Office of Technology			
Title	**ID Number**	**Effective Date**	**End-of-Life Date**
Patch Management Policy	SEC-POL-PM001.01	1/28/15	
Related Documents:	Critical Applications/Systems List Patch Management Exceptions List		

TABLE OF CONTENTS

1.0 Introduction

1.1 Point(s) of Contact

Goutam Kundu, Chief Information Officer, (703) 417-8762.
Kevin James, Information Security Director, (703) 417-8363.
Alourdes Bornelus, MA-600 Technical Writer, (703) 417-3937.
Technology Service Desk, (703) 417-TECH (8324).

2.0 Overview

The Metropolitan Washington Airports Authority (Airports Authority) is responsible for ensuring the confidentiality, integrity, and availability of its data and that of customer data stored on its systems. As such, the Airports Authority has an obligation to provide appropriate protection against threats, such as viruses, malware, and external or internal unauthorized access, which could adversely affect the security of these systems and information. Effective implementation of the Patch Management Policy (policy) will limit the exposure and effect of malware and other types of threats to systems and applications within this scope.

3.0 Purpose

The purpose of this policy is to establish the requirements for maintaining up-to-date operating systems and application security patches on all Airports Authority owned and managed systems and networks.

4.0 Scope

This policy applies to all devices, systems, and applications that contain hosts, or transmit company or customer data, which are owned or managed by the Airports Authority regardless of location. This includes, but is not limited to, the following:

- Servers
- Workstations/Desktops
- Tablets, laptops, and other mobile devices
- Switches, routers, firewalls, and other networking devices
- Proprietary applications and commercial off-the-shelf (COTS) software

5.0 Roles and Responsibilities

The following Office of Technology teams are responsible for implementing the patch management process and adhering to the policy for their respective areas. Each group must document patching procedures for systems and applications they are responsible for supporting and conducting periodic reviews of these procedures.

5.1 Technology Operations

Ensures all patching requirements of operating systems, network devices, databases, and telecommunication equipment under their management.

5.2 Desktop Engineering

Ensures all patching requirements of operating systems of User endpoint devices and client software under their management.

5.3 Application Development and Business Innovation

Ensures all patching requirements of applications they have responsibilities for supporting.

5.4 Information Security

Ensures all patching requirements of security devices or software under their management. Additionally, the Information Security Department is responsible for routinely assessing compliance with this policy and providing guidance to all Office of Technology departments concerning security and patch management procedures.

5.5 Technology Review Committee

Ensures regular patching procedures follow the change management process. Approves out-of-band patching Change Requests (CRs) using the expedited CR process.

6.0 Policy

Security patches should be applied to Airports Authority systems and application as reasonably as possible following a patch release. There are several types of security patch priority levels: Critical, Important, Moderate, and Low. The Critical and Important patches are of utmost concern as they pose the highest risk to Airports Authority systems and applications if not applied in a timely manner. Patches shall be applied according to the Patch Priority Matrix (see Appendix A).

Table 1 – Patch Priority Definitions

Rating	Definition
Critical	▪ A vulnerability where an exploit can be performed without user interaction and allows execution of code, escalation of privileges, etc. ▪ Exploit is simple perform and/or has already been detected in the wild. ▪ Any patch where a vendor recommends customers apply the patch immediately.
Important	▪ A vulnerability where an exploit can compromise data or the availability of processing resources. ▪ Exploit is moderately difficult to perform and/or has not been detected in the wild. ▪ Any patch where a vendor recommends customers to apply the update at the earliest opportunity.
Moderate	▪ Vulnerability is difficult to exploit. Authentication is required to carry out the exploit. Vendor recommends customers to consider applying patches.
Low	▪ Impact of vulnerability is low. Unlikely to be exploited or would have minimal consequences. Vendor recommends customers evaluate whether or not to apply update.

6.1 Patch Testing

For systems and applications required to support the critical functions and operations of the Airports Authority, patches must be tested before implementation into production environments. Testing is necessary to minimize the risk of adverse events during a security patch. In cases where a security patch has been determined to break an application, patch teams shall only remove the offending patch.

It is the responsibility of the IT application owner to contact the application vendor for a solution in order to reapply a patch. Additionally, the IT application owner should forward all information concerning patch reapplications to the Information Security Department with a committed date and time for resolving the issue.

6.2 Out-of-Band Patching

Out-of-band patches are vendor provided patches that fall outside of their normal patch release cycle. These patches typically address a critical vulnerability that is easily exploitable or where there are known cases of exploitation or both. These patches must follow the implementation schedule as defined in the Patch Priority Matrix (see Appendix A).

6.3 Trusted Sources

Patches must be downloaded from the relevant system or application vendor, or other trusted sources.

6.4 Installation of New Systems, Applications, and Devices

All new systems, applications, and devices falling within the scope (see 4.0 – Scope) of this policy shall be fully patched before implementation into Airports Authority production, development, test, and pre-production environments.

7.0 Monitoring and Reporting

All patching teams noted in the Roles and Responsibility section (5.0) are required to compile and maintain metrics that summarize the outcome of each patching cycle. These reports shall be retained and made available to the Information Security Department. Reports shall be used to evaluate the current patching levels of all systems and to assess the current risk level. The Information Security Department is responsible for periodically reporting the Airports Authority Security patching posture to the CIO and VP for Technology.

8.0 Cloud, Hosting, and other Third Party Providers

Airports Authority data that is housed on systems not under the direct management of the Office of Technology (MA-600), must have system and application patching processes that meet or exceed Airports Authority patching standards. Examples include, but are not limited to, data stored by: cloud service providers, external third parties, and internal third parties managing Airports Authority special networks and infrastructure. All third party contracts shall include language requiring industry best practice patching processes. Additionally, contracts shall include language that permits the Airports Authority to conduct periodic reviews and verify the patch status of third party providers.

9.0 Enforcement

Office of Technology Directors and their staff are ultimately responsible for implementing and enforcing this policy. Any system or application that is in violation of this policy shall require immediate corrective action.

10.0 Exceptions

Exceptions to the Patch Management Policy require formal documented approval from the Information Security Director and the Office of Technology VP.

11.0 Granted Authority

This Office of Technology, Patch Management Policy is hereby adopted for implementation on this _____ day of _____________, 2015 by the Chief Information Officer (CIO):

Approval Signature

_________________________________ ____________________
(Signature) (Date)
Goutam Kundu, CIO

Appendix A

Patch Priority Matrix

System	Description	Critical/Important	Out-of-Band	All Others
External (Internet Facing)				
Internet facing servers, applications, and other devices.	Any Airports Authority systems and/or applications that are accessible from the Internet (i.e., Web applications, DMZ servers, firewalls, switches, routers, VPNs, etc.).	Must be applied during the monthly IT maintenance window.	Patches must be tested and applied within two (2) days of patch release date.	As necessary.
Internal Systems				
Critical applications, servers, and other devices.	These systems are essential to Airports Authority operations or host sensitive or regulated data (i.e., parking systems/ applications, Human Resources, financial systems, etc.).	Must be applied during the monthly IT maintenance window, otherwise an exception is required. **Ref Critical Applications/Systems List**.	Patches must be applied within five (5) days of the patch release date.	As necessary.
Non-critical applications, systems, and other devices (e.g., pre-production/user-Acceptance-Testing (UAT) and development systems).	These are non-production systems and their impact to continued operations of Airports Authority systems is minimal.	If systems contain sensitive or proprietary information, patches must be applied during the monthly IT maintenance window. Otherwise, no later than one (1) month after patches are released.	Must be applied within five (5) days of patch release date.	As necessary.
User Endpoint Devices				
Workstations/desktops, laptops, tablets and other mobile devices.		Should be updated automatically where feasible. Otherwise, no later than two (2) weeks after patches have been released.	Must be applied within five (5) days of patch release date.	As necessary.

Note: Implementation timeframes means that patches have been deployed in production and verification testing has been completed.

NETWORK DESIGN MANUAL

1ST Edition

2001

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

NETWORK DESIGN MANUAL

1ST Edition

Year 2001

APPROVED BY:

Merrill Phelan

Manager, Information Systems Office

MA-610

METROPOLITAN WASHINGTON AIRPORT AUTHORITY
INFORMATION SYSTEMS OFFICE (MA-610)

1 Aviation Circle, Suite 248 ✈ Washington, DC 20001-6000

PREFACE

The Metropolitan Washington Airports Authority has a complex network infrastructure as well as a number of network systems supporting its operations. These network systems are constantly being upgraded and expanded to support the ever-changing requirements imposed on divisions within the Authority. This document will present the standards for drawings, both logical and physical, as they pertain to new network systems, expansion to existing systems, and modifications to the backbone infrastructure. The goal of this document is to provide direction for future network engineering endeavors by outlining the accepted layout and symbolism for computer network design. This standard is expected to influence the following areas:

- Logical drawings for concept presentation
- Installation drawings providing superior design accuracy
- “As Built” design providing a basis for ongoing support by the network contractor

This standards guide will pertain to all new systems development and all systems upgrade to be initiated within the Authority. This guide will provide direction for logical network representations, equipment representation, connection representation, overall drawing format, and cable identification and labels.

The Metropolitan Washington Airports Authority has installed, and continues to expand, a complex cable plant consisting of Fiber Optic Cable, both Single-mode and Multi-mode, and Category 5 Unshielded Twisted Pair Cable (UTP). All Single-Mode and Multi-mode fibers are terminated at Light Interface Units (LIU’s) located at various locations throughout the airport. To support network connectivity in the future, all new horizontal cabling will be Category 5 UTP or above. Vertical cabling will be accomplished using fiber optic cable that meets each individual build-out requirement. Single and Multi-mode fibers provide connectivity for the 1 Gigabit (802.3z) LAN Backbone and provide an upgrade path to the proposed 10 Gigabit Ethernet standard. Unshielded Twisted Pair cables are terminated at AT&T 110 Blocks. The 110 blocks, in association with RJ-45 patch panels, provide the termination point for all UTP cable. The airport standard for 110 block wiring and associated patch panels is EIA/TIA-568A.

During the evolution of the network environments within the Authority, many equipment vendors were employed to provide connectivity to the user community. This practice has required the Authority support equipment from 3Com, Bay, SMC, BOCA, and Cisco. With the complex nature of the network and the different equipment support requirements, it was determined that standardization on one vendor was the most cost effective approach to support and maintenance. The Metropolitan Washington Airports Authority has chosen to standardize on equipment provided by Cisco Systems. Based on that decision, the symbols presented in this guide are specific to that vendor. As new equipment becomes available from Cisco Systems, symbols will be developed and integrated into this guide. *It is the responsibility of the document*

generator to ensure that all symbols are properly represented. To meet this goal the document generator may be required to develop a symbol not included in this guide.

Scott Rose
Senior Network Engineer

CONTENTS

NETWORK DESIGN MANUAl

SECTION I:

1.0 BASIC STANDARDS

1.1 NETWORK DRAWING APPLICATIONS

Microsoft's Visio is the application currently used by Authority contractors for the internal block network diagrams. Bentley's Microstation is the Authority's paramount CAD software for all drawing files. The Authority has recently accepted AutoCAD for Architectural Engineering contractors. Leaving Microstation as the only designated application for Civil and Structural designs. For record keeping purposes, all CAD drawings must be translated into Microstation and conform to the most current standard prior to final delivery to the Authority.

1.1.1 Visio

Microsoft's Visio 2000 enables Engineers to effectively design with the use of stencils and templates. Engineers can produce charts and flowcharts, design schematics and annotate CAD drawings and develop network designs. This program was designed to effectively import and export both AutoCAD and Microstation.

1.1.2 Microstation

The Authority has been using this software for more than ten years.
Microstation historically has been used for all facets of Engineering. Making Network Design a task it will easily perform. Equipped with advanced geographic capabilities, this is likely to remain the CAD software of choice for the future.

1.1.3 AutoCAD

Due to contract requirements, the Authority supports this program. AutoCAD is a fairly new platform for the Authority. Its translation process into Microstation has been known to cause problems.

1.2 DESIGN CONCEPTS AND DOCUMENTATION

In order to meet Network Engineering requirements, the Information Systems Office of MA-610 must be notified at least ninety days in advance. Prior to any new network installations.

While drawings provide a visual guide to the construction of a network, specific information for each link is difficult to provide in the drawn environment. To ensure that construction of a network segment meets the requirements of the network, additional information shall be presented in the form of spreadsheets providing, at a minimum, the following information.

1.2.1 Switches and Hubs

Using either the hub or switch designation or, in the event of switches that accept cards, the switch and slot designation information pertaining to the individual connections will be maintained. This information will be compiled into a spreadsheet and kept up to date as connections are changed or moved. The spreadsheet will contain the following information: slot number (if appropriate), port number, connected to, speed or auto-sense, duplex (half or full), and connection type (SC, ST, or RJ-45).

1.2.2 Servers

Using the server name as the designator, list operating system, IP number and subnet mask (1.2.3.5/24), Primary function and any secondary functions.

1.2.3 Workstations

Identify workstations by use or location, operating system, IP number and subnet mask, and any special features.

1.2.4 Other Devices

Identify printers, scanners, terminals, plotters, etc., by function. Where applicable, identify IP number and subnet mask, or special connection speeds and configuration (9600,8,1,n), and special information necessary for the maintenance of the device in its operating environment.

A representative spreadsheet is presented below:

Table 1.0 - Spreadsheet

Slot/Port	**TO:**	**Speed**	**Duplex**	**IP Number**
2/1	Primary Domain Controller	100	Full	10.1.1.3/24
2/2	Secondary Domain Controller	100	Full	10.1.1.4/24
2/3	Database Server	100	Full	10.1.1.5/24
2/4	Admin Workstation	100	Full	10.1.1.201/24
2/5	Open			
2/6	Communications Server	10	Half	10.1.1.105/24
3/1	Workstation - Tom	100	Full	10.1.1.210/24
3/2	Workstation - Marry	100	Full	10.1.1.211/24
3/3	Workstation - Joe	100	Full	10.1.1.212/24
3/4	Workstation - Sue	100	Full	10.1.1.213/24
3/5	File/Print Server 1	100	Full	10.1.1.7/24

3/5	Open			

1.3 DRAWING FILE NAMES AND STANDARDS

All CAD drawing files should comply with the Authority Design Manual, Appendix 3, and CADD Standards. The following standards are designed for the Microstation application. Each file shall consist of elements to be printed only. All levels shall be turned on.

Drawing file names shall display project number, month and year. (EXAMPLE……. 8809-0101)

Each drawing file will consist of graphics pertaining to only one drawing. Drawing files consisting of more than one drawing will not be accepted.

The working units shall be in feet and inches. If your drawing covers a large area with a variance in accuracy, this is the only exception. The Microstation Master Seed file's working units are set at 12:8000 for DCA and 10:1000 for IAD.

When designs are displayed over a Civil background, drawings shall use the 3D Master seed file. Area background drawings shall be requested through MA-30 and then attached to design files as a Reference File.

The standard font shall be Font 23 for existing documentation and Font 1 for proposed documentation. If equal spacing is needed, Font 3 is then authorized.

Table 2.0 - File Name Extensions

File Name	**Extensions**
Visio Drawing Files	.VSD
Visio Stencils	.VSS
AutoCAD Drawing Files	.DWG
AutoCAD Block Files	.BLK
Microstation Drawing Files	.DGN
Microstation Cell Libraries	.CEL

Table 3.0 - Scale Factors (Text and Drawings)

Drawing Scale	Factor
None	1
1/16” = 1’-0”	192
1/8” = 1’-0”	96
¼" = 1’-0”	48
½" = 1’-0”	24
1” = 1’-0”	12
1” = 10’	120
1” = 20’	240
1” = 40’	480
1” – 50’	600
1” – 100’	1200

Table 4.0 - Text Sizes (Fonts 1, 3, and 23)

Type	Text Size	Weight
Main Title	1/4” (0.25)	4
Subtitle	3/16” (0.18)	2
Notes	1/8” (0.12)	2

Drawings with attached Civil backgrounds, must utilize the Airport Grid Coordinate System. For details, please refer to the Design Manual, CADD Standards, Appendix 3, Figure-1-1 and 1-2.

For Line Weights, Color and Line Codes, please refer to the Design Manual, CADD Standards, Appendix 3, Tables 4-6.

1.4 PLOTTED DRAWINGS

All plotted drawings will have the file name, date and time placed outside the lower right hand border (Font 1, Text size .25 inches). Plotted drawings shall comply with applicable ANSI standards and placed on the appropriate size paper to best visualize the design. See table below:

Table 5.0 - Standard Sheet Sizes

Drawing Sheet	Size
A	8 1/2" x 11"
B	11" x 17"
C	17" x 22"
D	22" x 34"
E	34" x 44"

1.5 TRANSLATIONS AND DOCUMENT FORMATS

Prior to final design delivery to the Authority, all Visio and AutoCAD drawings shall be translated into the current version of Microstation. Each drawing shall then comply with applicable standards. Drawings that do not comply with standards will be rejected.

1.6 FILE EXCHANGE

The following specifies requirements concerning the delivery of all network CAD designs to the Authority.

Hard copies of the drawing design will be submitted along with PKZIP self extracting files on a 3 ½ inch disk or CD.
This disk shall consist of appropriate drawing files and a text file listing, identified as (README.TXT).
The text file should list all file names on the disk and provide a detailed description of each files contents.

SECTION II:

2.0 CONNECTIVITY DESIGN RECOMMENDATIONS

To ensure the continued operation and evolution of both packet and switched networks, a recommendation for building connectivity has been developed for both new and expansion construction. This recommendation addresses the connectivity, both fiber optic and copper cables, termination, identification and power requirements.

These recommendations will provide a baseline for network infrastructure installation and ensure physical and bandwidth expansion.

2.1 NEW CONSTRUCTION

During the design phase of new facilities, ongoing, proactive planning is essential in meeting infrastructure and bandwidth growth requirements. Specific challenges, unique to the telecommunications/data communications systems, must be addressed to ensure network evolution. With the development of new communications standards, and new equipment to support these standards, a coordinated effort between facilities designers and communications professionals is necessary to project requirements of future system and implement these requirements into facilities being built today.

2.1.1 External Cable Feed

While the design of each structure will affect where cable is brought into the facility, general guidelines are presented to ensure, where possible, no single points of failure exist and alternate bandwidth paths are provided.

To achieve this goal, cable ducts, providing a path for intra-building connectivity, should be positioned so that dual cable paths are provided. These paths should be installed on opposite sides of a structure, whenever possible, or on adjacent sides, when necessary, to eliminate a failure due to cable damage.

Due to the high costs associated with multiple cable ducts, not all construction will implement this recommendation. Each project will require careful evaluation to see if this recommendation is applicable.

2.1.2 Power Requirements

Power requirements are divided into two (2) categories: standard and emergency.

2.1.2.1 Standard Power

Each equipment closet will be provided with a minimum of two (2) independent electrical circuit, non-switched, to provide power for network equipment. These circuits will provide 110 Volts, 20 Amps to Quad plug outlets.

2.1.2.2 Emergency Power

Each equipment closet will be provided with emergency power. The emergency power source may be an Uninterruptible Power Supply (UPS) fed by standard power or an in-line Uninterruptible Power Supply (UPS) that conditions input power and is always in use. If an emergency bus is provided, an emergency generator, 30 minutes of UPS power will be required. If no emergency bus is available the minimum requirement for UPS support will be 2 hours. In the event of an emergency bus is provided, cut over to emergency power should not require manual intervention.

The required power, KVA, for each UPS will be determined by the equipment associated within the supported area.

2.1.3 Cable Requirements

Cable requirements will differ with the structure requirements however; minimum standards have been identified to ensure connectivity and future growth.

2.1.3.1 Intra Building

In order to provide connectivity to the existing Authority network, new construction will provide fiber optic and/or copper cabling to each new construction site, as determined during planning. When a design requirement requires the construction of dual cable ways, these cable ways will be constructed so as to ensure connectivity should one cable way be destroyed or otherwise disabled.

2.1.3.2 Inter Building

In order to provide connectivity to the existing Authority network, new construction will use category 5, or above, UTP to provide a horizontal wiring plant. Network cables will be home run to the communications closet and will not be daisy chained. Where multiple floors are involved, fiber optic cable will provide connectivity between floors. The number of cables and/or fibers with be determined during the design phase of the project and should be reviewed by both the Telecommunications (MA-620) and Information

Systems (MA-610) Departments. Network connections will be provided wherever a telephone connection is provided or as designed.

2.1.4 Communication Closet Requirements

Communication Closets provide two functions: they provide a connection point for backbone cables and as the distribution point for user connectivity. Whether building input cables are terminated in a closet or it functions as a distribution point the minimum layout and configuration for closets is defined below.

- Communication closets will be a minimum of 8’X8’.
- The Main Communication closet will be defined as the point where external cables are terminated in the building.
- There will be a minimum of one communication closet per floor. These closets will support both telephone and data access. Data and telephone termination blocks will be separated as room size and design allows.
- Access to communication closets will be controlled using card swipes and keypads or other means that restrict access.
- Additional communication closets will be required when the distance between a closet and its furthest supported data end-point exceeds 270 feet or approximately 80 meters. This provides a minimum standard for Office Space while allowing greater distances between closets when in warehouse or storage areas.
- When a building has multiple floors, communication closets should be arranged so that the closets are directly above one another. This ensures direct access between closets and also provides for the shortest cable path.

2.1.5 Network Port Numbering Scheme

In order to identify port location, for new installation and for existing identification, all data ports will be numbered in a consistent manner. Numbering shall be done at the distribution point and at each end point. The following standard shall be applied to all data ports within the Authority. When an entire campus is being represented, building numbers will be applied to identify the exact location.

2.1.5.1 Room and Jack Number

Each room within a building will be identified with a room number. When in multiple floor structures it is assumed that each room number will start with the floor number i.e., 101 is on the first floor, 201 is on the second floor, etc. When room numbers do not identify a floor a leading number and a dash will indicate the floor i.e., 2-10 is room 10, second floor. Data jacks within each room will be identified, in a clockwise rotation around the room, with the port number of the jack within the room. A typical data number would be: 2-10-4 or 210 – 4.

2.1.5.2 Patch Panels and Equipment Ports

Patch panels are located in communications closets. These devices are rack mounted and will be numbered using the panels location on the rack; top being A, next down being B, etc. The ports on a patch panel will be numbered from left to right and from top to bottom; 1 – 12, 2 – 24, etc.

Equipment ports will be numbered using row or blade number and port number. This is the standard used within Cisco's IOS on switches. Equipment port numbers will be represented using the following numbering scheme: 1-1, 1-2, … 3-23, 3-24, etc.

All connected ports will be identified within the IOS, when applicable, to identify the edge device (Users Name or Port Number, Servers Name, etc.). This is the responsibility of the technician connecting the data port.

2.2 EXPANSION CONSTRUCTION

During the planning for, and the remodeling of existing facilities, telecommunications and networking personnel should be consulted to provide connectivity requirements. Specific issues can be addressed that ensure connectivity and future growth. All areas listed under Section 2.1 of this document may apply to expansion construction.

SECTION III:

3.0 SYSTEMS INEGRATION

System integration, as used here, is the process of installing, testing and putting a new system into operation where an interfaces with the Authority network is required. Any system that interfaces to the authority network will require a minimum 30-day notice be provided to MA-610 to ensure all Authority requirements are fulfilled.

3.1 INTERNET / TRANSMISSION CONTROL PROTOCOL (TCP/IP)

Any system that requires TCP/IP numbers must request such numbers from MA-610. No system may be installed onto the Authority network without meeting MA-610's numbering scheme.

3.2 DOMAIN NAMES AND RELATIONSHIPS

Any Domain Name requirements or special relationships required to interface with the Authority network must be submitted to MA-610 for review and approval.

3.3 SPECIAL REQUIREMENTS

In the event special considerations are required for a specific project or demonstration, such as bypassing "WebSence" or allowing specified traffic through the firewall, a written request must be presented to MA-610 with sufficient time for the technical staff to review, evaluate and, if approved, support the action requested.

SECTION IV:

4.0 DRAWING SPECIFICATIONS

In this section, we will provide specifics for design and presentation standards. Items in this section are subject to change. Contact the Information Systems Office of MA-610 for the current items. All items are based on the final presentation in a Microstation format.

4.1 BORDER SHEETS

The standard border sheet is currently being constructed by MA-30 and will soon be available through the Authority Web Site (www.mwaa.com). Select "Publications" and download the appropriate border. If necessary, contact the Information Systems Office for further assistance.

4.2 CELLS, BLOCKS AND STENCIL LIBRARIES

The most current libraries are being developed and once completed, will be available through the Authority Web Site (www.mwaa.com). Select "Publications" and download the appropriate library. If necessary, contact the Information Systems Office for any assistance.

4.3 ELECTRICAL NETWORK LEVELING SCHEME

The following reflects the Authority's Electrical Leveling Scheme, as defined in the Design Manual, CADD Standards, Appendix 3 2000 publication.

Table 6.0 - Leveling Scheme

Level / Layer	Description	Remarks
1	User Defined	
2	Building Outline	
3, 4	User Defined	
5	Riser Diagrams	
6	Flow Diagrams	
7	Control Diagrams	
8	Single-Line Diagrams	

9	Demolition – Items to be removed	
10	Demolition – Items to remain	
11	User Defined	
12	Electrical Equipment (Above Ground)	
13	Electrical Equipment Below Ground	
14	Junction Boxes	
15	User Defined	
16	Switches	
17	User Defined	
18	User Defined	
19	User Defined	
20-29	Lighting	
30	Wiring Cables	Power
31	Receptacles, Clock Outlets, etc..	Power
32	Busway, Cable Tray, Wireways	Power
33	Symbols	Power
34	Text	Power
35	Wiring Cables	Circuit Lines
36	Circuit Identifier Tags	Circuit Lines
37	Controls	Circuit Lines
38	Symbols	Circuit Lines

39	Text	Circuit Lines
40	Circuits	Ground System
41	Ground System	Ground System
42	Symbols	Ground System
43	Text	Ground System
44	User Defined	
45	Wiring Cables	Security Systems
46	**Routers**	**Network Systems**
47	**Gateways**	**Network Systems**
48	**Bridges**	**Network Systems**
49	**Servers**	**Network Systems**
50	**Appliance Firewalls**	**Network Systems**
51	**Firewalls**	**Network Systems**
52	**Main Switch**	**Network Systems**
53	**Hubs**	**Network Systems**
54	**Databases**	**Network Systems**
55	**Workstations**	**Network Systems**
56	**Terminals**	**Network Systems**
57	**Scanners**	**Network Systems**
58	**Printers**	**Network Systems**
59	**Cisco Routers**	**Network Systems**
60	**Cisco Switches**	**Network Systems**

61	**Cisco Servers**	**Network Systems**
62	**Cisco Firewalls**	**Network Systems**
63	User Defined	

APPENDIX A

GLOSSARY OF TERMS

1.0 Routers – The Metropolitan Washington Airports Authority uses Cisco Routers to meet need to transport information between divisions and/or airports. The 7500, 4500, 3600, 2500, and 1600 families of router are either in place or planned for immediate installation within the Authority. When using the symbols associated with each router family include the model number, number of serial ports and the number of Ethernet ports and the speeds and connectors associated with each port type i.e., ST, SC, RJ-45 and 10 Mbps, 100 Mbps, 1Gbps, 750 Kbps, T1, etc. Where possible the drawings should indicate the IP number, Net Mask and routing protocol associated with each link.

2.0 Communications Server – The Authority currently uses a Cisco 5200 to provide dial-up capability to the service networks. This system is presently configured with one (1) PRI line providing 24 lines in a rotary access method. This unit can be upgraded with an additional PRI line to provide 24 more lines if the need should arise. Any additional dial-up services, beyond the 24 available with another PRI line, will require a Cisco 5300 Communications Server or greater version of the Cisco Communication Server.

3.0 Firewall – The Authority networks are protected from unauthorized users by the Cisco PIX firewall appliance. This device provides firewall protection and supports the WebSense product. PIX firewalls are to be installed at both airport facilities. The diagram of the PIX firewall should indicate each network supported as well as identify the DMZ(s) and Service Networks. Future firewall installations may require the implementation of a Proxy-type firewall system. In the event this becomes necessary, a server should be identified as a firewall, indicate the Operating System, firewall software installed and list the active interfaces and their functions (DMZ or Service). The IP number and Net Mask associated with each port should be identified.

4.0 Main and Workgroup Switches – The switches used within the authority have been provided by a number of vendors including Cisco, Bay and 3Com. For all future networks the Cisco switch has been selected as the Authority Standard. Acceptable switches include the Cisco 6500, 5500, 5000, 4000, 3600 and 2900 Family of switches. The appropriate diagram(s) will represent these switches and notations as well as a card-by-card listing of ports, their termination points, speed and duplex, as well as the connection supported. Each card listing will also indicate any VLAN configurations within a switch and between switches. Notations of SNMP and/or RMON management and reporting will be indicated.

5.0 Hubs – Hubs have been historically used to provide connectivity to small groups of users throughout the Authority. This practice is no longer being supported due to the complexity and traffic requirements of new, CPU and network demanding, applications. It may be in the best interest of the Authority to use hubs when building and/or connecting special

purpose servers and their associated workstations. In the event hubs are proposed it is up to the respondent to represent the hubs and to provide connectivity listings. Information on SNMP and/or RMON capability should also be listed.

6.0 Servers – The Authority has standardized on the Dell Computer family of servers to provide general application support to the user community and on Digital Equipment Corporation (DEC) equipment where special applications are required. These servers can be used in a number of areas. This class of server should identify servers as Application Servers, Database Servers, Gateways, Video Server, or any other function that is supported. When a server acts in a multiple application environment, the primary application should be identified with the server. Where the Authority uses Digital Equipment Corporation (DEC) equipment the primary machines belong to the Alpha Series of Servers, currently the Alpha 1000 and Alpha 4000. Where the Dell Servers are utilized the primary systems include the Dell 1300, 2400, 3400, 4400, 6300, 6350, and the Dell 6400 Servers.

7.0 Workstations – The Authority has standardized on the Dell Computer family of workstations. The primary workstation is the Dell OptiPlex GX1p. The configuration of this workstation varies with the application that it is expected to support.

8.0 Terminals – The Authority has used dedicated terminals in very few instances. These cases are associated with special purpose systems that require a terminal to act as the console for the system.

9.0 Scanners and Printers – The Authority primary manufacturer of choice for scanners and printers has been Hewlett-Packard.

APPENDIX B

NETWORK ABBREVIATIONS

A

AAL	ATM Adaptation Layer
AAL-PCI	AAL Protocol Control Information
AAL-SDU	AAL Service Data Unit
ABR	Available Bit Rate (s. CBR, UBR, VBR)
ACE	Access Connection Element
ACF	Access Control Field (in DQDB slot)
ACSE	Association Control Service Element
ADM	Add/Drop Multiplexed
ADMD	ADministrative Management Domain / Differential
ADPCM	Adaptive Delta/Differential Pulse Code Modulation (32Kbps pro Kanal, vgl. CS-ACELP, PCM)
ADSL	Asymmetric Digital Subscriber Line
AESA	ATM EndSystemAddress (PNNI)
AFI	Address Format Identifier/Authority and Format Identifier
AMI	ATM Management Interface (FORE)
AIMS	Action team for the Integration of Management Systems
AINI	ATM Inter-Network Interface
AIP	ATM Interface Processor (Cisco 7000)
AIS	Alarm Indication Signal (=OAM-cell/UNI Fault Management)
AIX	Advanced Interactive eXecutive (=IBMs UNIX)
AMI	Alternate Mark Inversion / ATM Management Interface (FORE)
AMS	Audio visual Multimedia Services
ANIS	ATM Narrowband Interface S2 (Siemens)
ANNI	Interconnection of PNNI and CCS7
ANSI	American National Standards Institute
API	Application Programming Interface
APPC	Advanced Peer-to-Peer Communication
APPN	Advanced Peer-to-Peer Networking
APS	Automatic Protection Switching
APTM2	ATM Port Trunk Modul (2 Ports, Siemens)
ARA	Appletalk Remote Access; externes Zugangsprotokoll
ARM	ATM Router Modul (Cisco)
ARP	Address Resolution Protocol
ARQ	Automatic Repeat reQuest
AS	Automonous System (OSPF)
ASE	Application Service Element
ASIC	Application Specific Integrated Circuit
ASN.1	Abstract Syntax Notation One
ASN32	ATM Switching Network (32x32 Matrix, Siemens)
ATDM	Asynchronous Time Division Multiplexing (vgl. STD, TDM)
ATM	Asynchronous Transfer Mode; Automatic Telling Machine; Air Traffic Management; Adobe Type Manager
ATMARP	ATM Address Resolution Protocol
AU	Administrative Unit
AUI	Attachment Unit Interface

AW	Administrative Weight

B

B-ICI	Broadband Inter Carrier Interface (= carrier to carrier interface)
B-ISDN	Broadband Integrated Services Digital Network
B-ISDN PRM	Protocol Reference Model of the Broadband aspects of ISDN
B-LLI	Broadband Low Layer Information
B-NT2	Broadband Network Termination 2 for B-ISDN
BCD	Binary Coded Decimal
BECN	Backward Explicit/Error Congestion Notification
Bellcore	Bell Communications Reseach
BER	Bit Error Rate / Basic Encoding Rules (ASN.1)
BGAK-PDU	BeGin AcKnowledged PDU
BGN-PDU	BeGiN PDU
BGP	Border Gateway Protocol
BGREJ-PDU	BeGin REJect PDU
BIND	Berkeley Internet Name Dämon (Name-Server Version)
BIOS	Basic Input/Output System
BIP	Bit Interleaved Parity
BNP	Board Network module Port (FORE)
BoM	Begin of Message
BootP	Bootstrap Protocol
BRI	Basic Rate ISDN/Interface
BSD	Berkeley Standard Distribution
BT	Burst Tolerance
BUS	Broadcast and Unknown Server

C

CAC	Connection/Call Admission Control
CAD	Computer Aided Design
CAM	Computer Aided design Manufacturing
CAP	Carrier-less Amplitude / Phase modulation (s. DMT)
CAR	Customer Access Rate
CASE	Computer Aided Software Engineering
CB	Control Block (Siemens)
CBDS	Connectionless Broadband Data Service (fast identisch mit SMDS)
CBER	Cell Block Error Ratio
CBR	Constant Bit Rate (s. ABR, UBR, VBR)
CCF	Cross Correlation Function
CCITT	Comite Consultatif International pour le Telegraphe et Telephone / Consultative Committee on International Telephone and Telegraph (now ITU)
CCSS7/B-ISUP	Common Channel Signaling System7/Broadband-ISDN Signaling User Part (von ITU-T, entspricht PNNI)
CDPD	Cellular Digital Packet Data (de facto model for Omnipoint implem.)
CDR	Cell Rate Decoupling
CD-ROM	Compact Disk Read Only Memory
CDS	Cell Directory Services (vgl. GDS)
CDV	Cell Delay Variation

CDVT	Cell Delay Variation Tolerance
CEC	Common Equipment Card
CEQ	Customer EQuipment
CER	Cell Error Ratio
CERN	Centre Europeen pour la Recherche Nucleaire
CERT	Computer Emergency Response Team
CES	Circuit Emulation Service
CGA2	Clock Generator ATM (Release 2, Siemens)
CGI	Common Gateway Interface
CHAP	Challenge Handshake Authentication Protocol (vgl. PAP)
CI	Command Interpreter (MADGE)
CID	Configuration, Installation & Distribution
CIDR	Classless Inter-Domain Routing
CIF	Common Intermediate Format Format 352x288 pixel/frame, 30 frames/sec
CIM	Common Information Model
CIO	Chief Information Officer
CIP	Common Indexing Protocol
CIR	Committed Information Rate
CIVA	Computer Integrated Video on ATM (VideoKonferenz-System, Siemens)
CLEI	Common Language Equipment Identification
CLI	Command Line Interface
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
CLNAP	ConnectionLess Network Access Protocol
CLNIP	ConnectionLess Network Interface Protocol
CLNP	ConnectionLess Network Protocol
CLNS	ConnectionLess Network Service
CLP	Cell Loss Priority
CLR	Cell Loss Ratio
CLS	ConnectionLess Server
CLSF	ConnectionLess Service Function
CLTS	ConnectionLess Transport (Layer) Service
CME	Conformant Management Entity (OMNIPoint)
CMIP	Common Management Information Protocol (OSI)
CMIS	Common Management Information Services (OSI)
CMISE	Common Management Information Service Element (OSI)
CMOL	CMIP Management Over logical Link control
CMOT	CMIP Management Over TCP/IP
CMR	Cell Misinsertion Ratio
COLP	COnnected Line identification Presentation
COLR	COnnected Line identification Restriction
CoM	Continuation of Message
CON	CONcentrator
CORBA	Common Object Request Broker Architecture (OMG)
COSE	Common Open Software Environment
COSINE	Cooperation for OSI Networking in Europe
COTS	Connection Oriented Transport (Layer) Service
CPCS	Common Part Convergence Sublayer
CPE	Customer Premises Equipment
CPU	Central Processing Unit
CR-LDP	Constraint-based Routed Label Distribution Protocol
CRC	Cyclic Redundancy Check
CRF	Connection Related Function

CRM	Cell Rate Margin
CRV	Call Reference Value
CS	Convergence Sublayer (Schicht in AAL)
CS-ACELP	(Sprachkompression, 8Kbps pro Kanal, vgl. ADPCM, PCM)
CSi	Carrier Scale interworking
CSMA/CD	Carrier Sense Multiple Access with Collision Detection
CSU	Channel Service Unit
CTD	Cell Transfer Delay
CTS	Common Transport Semantics

D

DAC	Dual Attached Concentrator (FDDI)
DARPA	Defense Advanced Research Projects Agency (früher nur ARPA)
DAS	Dual Attached Station (FDDI)
DCC	Data Country Code
DCE	Distributed Computing Environment, Data Communications Equipment
DCT	Discrete Cosinus Transformation
DDCMP	Digital Data Communication Message Protocol (DEC)
DDI	Direct Dialling In
DE-CIX	Deutscher Commercial Internet eXchange
DE-NIC	DEutsches Network Information Center
DES	Data Encryption Standard
DFI	Domain Specific Part Format Identifier
DFN	Deutsches ForschungsNetz
DFS	Distributed File Service (vgl. DTS)
DHCP	Dynamic Host Configuration/Control Protocol
DIB	Directory Information Base (X.500)
DiffServ	Differentiated Services (IETF, vgl. IntServ)
DIT	Directory Information Tree (X.500)
DLC	Data Link Control
DLCI	Data Link Connection Identifier (in Frame Relay)
DLE	Distributed LAN Emulation
DLL	Dial Long Lines
DMA	Direct Memory Access
DME	Distributed Management Environment (OSF)
DMI	Desktop Management Interface / Definition of Management Information
DMT	Discrete Multi-Tone (multicarrier modulation, s. CAP)
DNA	Digital Network Architecture
DNS	Domain Name System / Service
DOMS	Distributed Object Management System
DPT	Dynamic Packet Transport (Cisco)
DQDB	Distributed Queue Dual Bus (MAN, normiert von IEEE)
DRAM	Dynamic Random Access Memory
DS1	Digital System/Signal level 1 (US: T1=1.544Mbps, Europe: E1=2.048Mbps)
DS3	Digital System/Signal level 3 (US: T3=44.736Mbps, Europe: E3=34.368Mbps)
DSA	Directory System Agent (X.500)
DSAP	Destination Service Access Point
DSL	Digital Subscriber Line
DSLAM	Digital Subscriber Line Access Multiplexer
DSP	Domain Specific Part

DSS	Distributed Sample Scrambler (Kodierverf mit Polynom X31+X28+1, -> SSS)
DSU	Data Service Unit
DTD	Document Type Definition (WWW)
DTE	Data Terminal Equipment
DTL	Designated Transit List
DTMF	Dual Tone Multiple Frequency
DTS	Distributed Time Service (vgl. DFS)
DUA	Directory User Agent (X.500)
DVMRP	Distance Vector Multicast Routing Protocol
DWDM	Dense Wavelength Division Multiplexing
DWMT	Discrete Wavelet Multi-Tone
DXI	Data/Digital eXchange Interface (bindet Router via DSU an ATM-Switch)

E

E1	2.048Mbps = DS1 in Europe
E3	34.368Mbps = DS3 in Europe
EBCDIC	Extended Binary Coded Decimal Interchange Code
EFCI	Explicit Forward Congestion Indicator
EGP	Exterior Gateway Protocol
EIA	Electronic Industries Association
EIGRP	Enhanced IGRP
EISA	Extended Industry Standard Architecture
ELAN	Emulated LAN
EMS	Element Management Systen
END-PDU	END PDU
ENDAK-PDU	END AcKnowledged PDU
EoB	End of Bus
EoM	End of Message
EPD	Early Packet Discard (s. PPD)
ERIP	Extended RIP
ESF	Extended Super Frame (DS1: = 24 x 193Bits)
ESI	End System Identifier
ESIG	European SMDS Interest Group
ESP	Encapsulating Security Payload (IP)
ETDM	Electrical Time Division Multiplex
ETSI	European Telecommunication Standards Institute

F

FAST	Frame ATM over Sonet Transport
FC	Fiber Connector (Stecker-Typ)
FCS	Frame-Check Sequence
FDDI	Fiber Distributed Data Interface (MAN, normiert von ANSI)
FDM	Frequency Division Multiplexing
FEBE	Far End Block Error (SONET)
FECN	Forward Explicit/Error Congestion Notification
FERF	Far End Receive Failure/Far End Reporting Failure (= OAM cell)
FIPS	Federal Information Processing Standard
FNNI	Frame UNI
FPGA	Field Programmable Gate Arrays
FR	Frame Relay

FSM	Finite State Machine
FTAM	File Transfer Access & Management
FTP	File Transfer Protocol
FUNI	Frame based User-to-Network Interface (ATM Forum)

G

GCAC	Generic Connection Admission Control
GCRA	Generic Cell Rate Algorithm
GDMO	Guidelines for the Definition of Managed Objects (OSI)
GDS	Global Directory Services (vgl. CDS)
GFC	Generic Flow Control (in ATM cell)
GFR	Guaranteed Frame Rate
GLP	Gateway Location Protocol (VoIP, IETF, s. SLP)
GOSIP	Government Open Systems Interconnection Profil/ Government OSI Profile/Protocol
GPRS	General Packet Radio Services
GPS	Global Positioning System (Satelliten-System)
GSM	Global System for Mobile communications
GSR	Gigabit Switch Router (Cisco)
GUI	Graphical User Interface

H

HCS	Header CheckSum / Sequence
HDLC	High level Data Link Control (Proto auf OSI Schicht2, vgl. SDLC)
HDTV	High Definition TeleVision (benötigt 5-20 Mbps)
HEC	Header Error Control/Check (in ATM cell und DQDB slot)
HLF	Higher Layer Function
HMI	Hub Management Interface (Standard von Novells NDMS f. Hub-Management)
HO-DSP	High Order - Domain Specific Part
HoB	Header of Bus
HOL	Header Of the Line
HPPI	High Performance Parallel Interface
HSRP	Hot Standby Router Protocol
HSSI	High Speed Serial Interface (Standard zur ser Übertr. mit 52 Mbps)
HTML	HyperText Markup Language (WWW)
HTTP	HyperText Transfer Protocol (WWW)
HTTPS	Secure HyperText Transfer Protocol (WWW)

I

I-PNNI	Integrated Private Network to Network Interface
I4DL	Interface, Inheritance, Implement., Install. Definition Language (OSF)
IAB	Internet Activities Board
IANA	Internet Assigned Numbers Authority
ICD	International Code Designator
ICMP	Internet Control Message Protocol
ICR	Initial Cell Rate
IDI	Initial Domain Identifier
IDL	Interface Definition Language (OMG)

IDP	Internet Datagram Protocol; Initial Domain Part
IDRP	InterDomain Routing Protocol (ISO)
IDU	Interface Data Unit (UNI 3.0)
IE	Information Element
IEEE	Institute of Electrical and Electronical Engineers (genannt: "I triple E"
IETF	Internet Engineering Task Force
IG	Information Group
IGMP	Internet Group Management Protocol
IGP	Internal/Interior Gateway Protocol
IGRP	Interior Gateway Routing Protocol (Cisco)
IISP	Interim Inter-switch Signalling Protocol = Vorläufer von PNNI
ILMI	Interim Local Management Interface
IMA	Inverse Multiplexing for ATM
IMTC	International Multimedia Teleconferencing Consortium
IntServ	Integrated Services (IETF, vgl. DiffServ)
IP	Internet Protocol (connectionless-mode (inter)network service)
IPng	IP next Generation = IPv6 = IP Version 6
IPX	Internetwork Packet eXchange (=Übertrag.protokoll von Novell (-> SPX)
IS-IS	Intermediate System-to-Intermediate System
ISDN	Integrated Services Digital Network
ISL	Inter-Switch Link Protocol (Cisco)
ISLAN	Integrated Services LAN
ISO	International Standardization Organization
ISP	International Standardized Profile / Internet Service Provider
ISV	Independant Software Vendor
ITSEC	Information Technology Security Evaluation Criteria
ITU-TSS	International Telecommunications Union Telecom. Standardiz. Sector (formerly CCITT)
IWU	InterWorking Unit
IXC	Inter eXchange Carrier

J

JAMES Project	Joint ATM Experiment on European Services (20 european Telecoms)
JPEG	Joint Photographic Expert Group color image coding and compression bis 25:1

L

L2M	Layer2 Module (Siemens)
LAN	Local Area Network
LANE	LAN Emulation (ATM Forum)
LAPB	Link Access Procedure Balanced (X.25)
LAppQos	Legacy Application Quality of Service
LAT	Local Area Transport (DEC)
LBUBR	Load Balanced UBR
LCD	Loss of Cell Delineation
LCP	Link Control Protocol

LDAP	Light-weight Directory Access Protocol (VoIP)
LDP	Label Distribution Protocol
LE-ARP	LAN Emulation Address Resolution Protocol
LEC	LAN Emulation Client; Local Exchange Carrier
LECS	LAN Emulation Configuration Server
LED	Light Emitting Diode
LES	LAN Emulation Server
LGN	Logical Group Node
LI	Length Indication
LIS	Logical IP Subnet
LL-ID	Loopback Location IDentification
LLC	Logical Link Control
LLC/SNAP	Logical Link Control/Subnetwork Access Protocol
LMI	Logical Management Interface (Frame Relay, ATM)
LNNI	LANE Network-Network Interface (ATM Forum)
LOF	Loss of Frame
LOS	Loss of Signal
LQM	Link Quality Monitoring (PPP)
LQR	Link Quality Report
LSAP	Link Service Access Point
LSB	Least Significant Bit
LSP	Link State Protocol / Label Switched Path
LSR	Label Switching Router (vgl. MPLS)
LSS	Link Status Signal
LUNI	LAN Emulation UNI

M

MAC	Medium Access Control
MAN	Metropolitan Area Network
MAPDU	Management Application Protocol Data Unit
MARS	Multicast Address Resolution Server (IETF)
MAU	Medium Attachment Unit / Multistation Access Unit (auch: MSAU)
MAY Project	Multimedia Application on Intercontinental Highway (transatlantic ATM)
MBONE	Multicasting backBONE
MBS	Maximum Burst Size
MCDV	Maximum Cell Delay Variation
MCLR	Maximum Cell Loss Ratio
MCR	Minimum Cell Rate
MCTD	Maximum Cell Transfer Delay
MD-PDU	Management Data PDU
MD5	Message Digest algorithm
MGCP	Media Gateway Control Protocol (VoIP, IETF)
MIB	Management Information Base
MID	Multiplexing IDentification / Message IDentifier
MICE	Multimedia Integrated Conferencing for European Researchers
MIME	Multipurpose Internet Mail Extensions
MIPS	Mega Instructions Per Second

MLP	MultiLink PPP
MMF	MultiMode Fiber
MOCS	Managed Object Conformance Statement
MOM	Manager Of Managers
MOP	Meta Object Protocol
MOR	Multiwavelength Optical Repeater
MOSPF	Multicast OSPF
MPC	MPOA Client
MPEG	Motion Picture Expert Group (benötigt 10 Mbps) Kompression für Motion Video/Audio bis 7:1
MPLS	MultiProtocol Label Switching
MPOA	MultiProtocol Over ATM (IETF)
MPS	MPOA Server
Mpx	MultiPleXer (CCITT I.324)
MRU	Maximum Receive Unit (PPP)
MSB	Most Significant Bit
MSN	Multiple Subscriber Number
MSOH	Multiplexer Section OverHead
MSP	Multicast Synchronization Protocol
MTA	Message Transfer Agent
MTU	Maximum Transmission/Transfer Unit
MUX	MUltipleXor (CCITT I.113)
MX-RR	Mail eXchange Resource Record

N

NAS	Network Attached Storages
NBMA	Non Broadcast Multiple Access
NCP	Network Control Protocol
NCSA	National Center for Supercomputing Applications (University of Illinois at Urbana Champaign)
NDIS	Network Driver Interface Specification (Microsoft, HP, 3COM, IBM)
NDS	Netware Directory Service
NETBIOS	NETwork Basic Input/Output System
NetWare	distributed filesystem von Novell
NFS	Network File System (SUN distributed filesystem protocol)
NHC	Next Hop Client (NHPR)
NHRP	Next Hop Resolution Protocol (IETF)
NIC	National Information Centre / Network Information Center
NIS	Network Information System
NIU	Network Interface Unit (segmentation, reassembly)
NLM	Netware Loadable Module (= Netware Versionengruppe3; vgl. VAP)
NLSP	NetWare Link State Protocol
NMF	Network Management Forum
NML	Native Mode LAN
NNI	Network-to-Network/Node Interface (Switch)
NNTP	Network News Transfer Protocol
NOC	Network Operation Center
NOS	Network Operating System
NP	Network Performance
NPC	Network Parameter / Policing Control
NPM	Network Processor Module (Cisco 4500)
NRM	Network Resource Management

NSAP	Network Service Access Point
NSC	National Support Center
NSF	National Science Foundation
NT	Network Termination (Referenzpunkte: TB an B-NT1, SB an B-NT2)
NTP	Network Termination Point / Network Time Protocol
NVP	Nominal Velocity of Propagation

O

AODM	Optical Add-Drop Multiplexer
OAM	Operation, Administration and Maintenance
OC-n	Optical Carrier level n (= ITU-T Standard) (vgl. STSn = SONET Standard)
ODA	Office (or Open) Document Architecture
ODI	Open Data link Interface (Novell)
ODIF	Office Document Interchange Format
ODLI	Open Data Link Interface (Novell)
OEM	Original Equipment Manufacturer (vgl. VAR)
OIM	OSI Internet Management
OME	Object Management Edge (AIMS)
OMG	Object Management Group
OMNIPoint	Open MaNagment Interoperability Point (ausgewählte Standardprofile der NMF)
ONC	Open Network Computing
OOA	Object Oriented Analysis
OOD	Object Oriented Design
OOP	Object Oriented Programming
ORB	Object Request Broker (OMG)
OSF	Open Software Foundation
OSI	Open Systems Interconnection
OSPF	Open Shortest Path First
OSS	Operation Support System
OTDM	Optical Time Division Multiplex
OUI	Organizationally Unique Identifier (IEEE)
OXC	Optical CROSS Connect

P

PABX	Private Automatic Branch eXchange
PAM	Pulse Amplitude Modulation
PAP	Password Authentication Protocol (vgl. CHAP)
PAR	PNNI Augmented Routing
PBX	Private Branch eXchange (telephone switchboard on the user premises)
PCB	Protocol Control Block
PCI	Protocol Control Information
PCM	Pulse Code Modulation (64Kbps pro Kanal, vgl. ADPCM, CS-ACELP)
PCR	Peak Cell Rate
PDH	Plesiochronous Digital Hierarchy
PDU	Protocol/Packet Data Unit
PEM	Privacy Enhanced Mail
PG	Peer Group

PGL	Peer Group Leader
PGLE	Peer Group Leader Election
PGP	Pretty Good Privacy
PID	Protocol IDentifier
PING	Packet INternet Groper
PIM	Protocol Independant Multicast
PIR	Packet Insertion Rate
PL	Physical Layer
PLCP	Physical Layer Convergence Protocol / Procedure (IEEE-802.6: im MAN Pakete -> PDH, Mechanismus=DQDB (53Bytes), Transport-Protokoll: US=SMDS, Europe=CBDS)
PLIM	Physical Layer Interface Module
PLR	Packet Loss Rate
PM	Physical Medium
PMD	Physical layer Medium Dependent
PNNI	Private Network to Network Interface (vgl. IISP)
PNO	Public Network Operator
POH	Path OverHead (in SDH)
POS	Packet Over Sonet/SDH
POSIX	Portable Operating System for UNIX
POTS	Plain Old Telephone Service
PPD	Partial Packet Discard (s. EPD)
PPP	Point-to-Point Protocol (TCP/IP)
PRMD	PRivate Management Domain
PROM	Programmable ReadOnly Memory
PT	Payload Type
PTE	Path Terminating Equipment (SONET)
PTM	Packet Transfer Mode
PTO	Public Telecommunications Operator
PTSE	PNNI Topology State Elements
PTSP	PNNI Topology State Packets
PTT	Post, Telegraph and Telephone (company)
PVC	Permanent/Privat Virtual Circuit/Permanent Virtual Connection
PVCC	Permanent Virtual Channel Connection
PVPC	Permanent Virtual Path Connection
PWI	Public Windows Interface
PWS	Personal WorkStation

Q

Q3	CCITT TMN: Schnittstelle zwischen OS + Nutzelementen (NE)
Q3, Qx, X, F, G	CCITT: Standardized Interfaces in TMN networks
QCIF	Quarter Common Intermediate Format 176x144 pixel/frame, 30 frames/sec
QoS	Quality of Service

R

RACE	Research on Advanced Communications in Europe
RAIG	Resource Availability Information Group
RAM	Random Access Memory
RARE	Reseaux Associes pour la Recherche Europeenne
RC	Request Counter

RCC	Routing Control Channel
RDF	Rate Decrease Factor
RED	Random Early Detect / Discard
RESYNC-PDU	RESYNChronization PDU
RFC	Request For Comment (TCP/IP Standard-Dokument)
RIF	Routing Information Field; Rate Increase Factor
RIP	Routing Information Protocol
RIPE	Reseaux IP Europeenne
RIPE NCC	RIPE Network Coordination Center
RISC	Reduced Instruction Set Computer
RM	Resource Management
RMOA	Realtime Multimedia Over ATM
RMON	Remote MONitoring (Standard-MIB von SNMP)
ROM	Read-Only Memory
ROSE	Remote Operations Service Element
RPC	Remote Procedure Call (aus DCE)
RS	Regenerator Section
RSAK-PDU	ReSynchronization AcKnowledge PDU
RSCP	Routing Services Control Point
RSOH	Regenerator Section OverHead
RSVP	Resource reSerVation Protocol
RTMP	Routing Table Maintenance Protocol
RTP	Realtime Transport Protocol
RTCP	Real Time Control Protocol
RTSP	Real Time Streaming Protocol (VoIP, Multimedia)
RTTI	RunTime Type Identification (WWW)

S

SAA	System Application Architecture (IBM)
SAAL	Signalling ATM Adaptation Layer
SAC	Single Attached Concentrator (FDDI)
SAIN	Specification of ATM Interworking among Networks
SAN	Storage Area Networks
SAP	Service Access Point / Service Advertising Protocol
SAR	Segmentation and Reassembly sublayer (Schicht in AAL)
SAS	Single Attached Station (FDDI)
SB	Switching Block (Siemens)
SC	Subscriber Connector (Stecker-Typ) / Stick nad Click
SCP	Switch/System Control Processor
SCPA	Service Control Point Architecture
SCR	Sustainable/Sustained Cell Rate
SCSP	Server Cache Synchronization Protocol
SCTP	Stream Control Transmission Protocol (IETF)
SD-PDU	Sequenced Data PDU
SDH	Synchronous Digital Hierarchy (europ. CCITT Standard, vgl. STMx; entstanden aus amerik. SONET/STSn/OC-n)
SDI	Storage Device Interface
SDL	Specification Description Language
SDLC	Synchronous Data Link Control (Protokoll auf OSI Schicht2, vgl HDLC)
SDP	Session Description Protocol (VoIP)
SDP-PDU	Sequenced Data with Poll PDU
SDU	Service Data Unit
SFET	Synchronous Frequency Encoding Technique
SFI	System Format ID

SFMA	Specific Functional Management Areas
SGML	Standard Generalized Markup Language (WWW)
SIG	SMDS Interest Group
SIM	Subscriber Identity Module
SIP	Session Initiation Protocol (VoIP)
SIPP	Simple Internet Protocol Plus (SIPP16 = 16 byte address)
SLIP	Serial Line Internet Protocol (in TCP/IP)
SLP	Service Location Protocol (VoIP, s. GLP)
SMDR	Storage Management Data Requester
SMDS	Switched Multimegabit Data Service (WAN-Dienst d. öff. Anbieter)
SME	Storage Management Engine
SMF	System Manager Facility / System Management Function / Simple Mode Fiber
SMFA	Specific Management Functional Areas
SMI	Structure of Management Information
SMS	Storage Management Service / Selective Multicast Service / Short Message Service
SMT	Synchronous Multiplex Terminal
SMTP	Simple Mail Transfer Protocol
SNA	Systems Network Architecture (IBM)
SNAP	SubNetwork Access Point / Area Protocol
SNMP	Simple Network Management Protocol (IETF)
SPANS	Simple Protocol for ATM Network Signalling (FORE proprietary)
SOH	Section OverHead (in SDH)
SONET	Synchronous Optical NETwork (vgl. STSn/OC-n, SDH/STMx) aus dem amerik. SONET ist 1988 der europ. CCITT-Standard SDH entstanden)
SPANS	Simple Protocol for ATM Network Signaling (FORE)
SPE	Synchronous Payload Envelope
SPF	Shortest Path First
SPVC	Soft Permanent Virtual Connection
SPVP	Soft Permanent Virtual Path
SPX	Sequenced Packet eXchange (=Übertrag.protokoll von Novell (->IPX)
SRP	Spatial Reuse Protocol (media independent MAC layer protocol)
SRTS	Synchronous Residual Time-Stamp
SSAP	Source Service Access Point
SSCF	Service Specific Coordination Function
SSCOP	Service Specific Connection Oriented Protocol
SSCP	Systems Services Control Point
SSCS	Service Specific Convergence Sublayer
SSL	Secure Socket Layer (verschlüsseltes Transportprotokoll)
SSRP	Server to Server Redundancy Protocol (Cisco)
SSS	Self Synchronizing Scrambler (Kodierverf mit Polynom X43+1, vgl. DSS)
ST	Segment Type / Straight Tip (Stecker-Typ) / Stick and Turn
ST-II	STream protocol version II
STDM	Synchronous Time Division Multiplexing (vgl. ATD, TDM)
STM	Synchronous Transfer Mode
STM1	155.520 Mbps = STS3/OC-3c
STM4	622.080 Mbps = STS12/OC-12
STMx	Synchronous Transport Module level x (Baustein der SDH)
STP	Shielded Twisted Pair / Spanning Tree Protocol

STS1	51.84Mbps = OC-1
STS3c	155Mbps = OC-3c = STM1 (c = concatenated)
STS12	622Mbps = OC-12 = STM4
STSn	Synchronous Transport Signal level n (Baustein von SONET Standard) = OC-n (ITU-T Standard)
SVC	Switched Virtual Circuit/Connection / Signalling Virtual Channel
SVCC	Switched Virtual Channel Connection
SVP	Switched Virtual Path

T

T1	Transmission link level1 = 1.544Mbps = DS1 in US
T3	Transmission link level3 = 44.736Mbps = DS3 in US
TA	Terminal Adapter (verbindet nicht-B-ISDN-fähige Geräte ans B-ISDN) / Transfer Agent
TAXI	Transparent Asynchronous Transmitter/Receiver Interface (100 Mbps)
TBE	Transit Buffer Exposure
TC	Transmission Convergence
TCB	TCP Control Block
TCP	Transmission Control Protocol (connection oriented transport service)
TCP/IP	Transmission Control Protocol/Internet Protocol (IETF)
TCRF	Transit Connection Related Function
TDM	Time Division Multiplexing (unterteilt in ATD und STD)
TDP	Tag Distribution Protocol
TE	Terminal Equipment (B-TE1 = B-ISDN fähig, B-TE2 = nicht fähig)
TEN-155	Trans European Network at 155 Mbps
TFTP	Trivial File Transfer Protocol (TCP/IP)
TIES	Telecom Information Exchange Services
TLV	Type, Length, Value
TMN	Telecommunication Management Network (ITU)
TP	Twisted Pair
TPD	Trailing Packet Discard (Vgl. EPD)
TPE	Transmission Path Endpoint
TRD	Transit Routing Domain
TSA	Target Service Agent
TTL	Time To Live
TTS	Trouble Ticket System
TU	Tributary Unit
TUG	Tributary Unit Group

U

UA	User Agent
UBR	Undefined Bit Rate (s. ABR, CBR, VBR)
UD-PDU	Unacknowledged Data PDU
UDP	User Datagram Protocol (verbindungsloses Protokoll in TCP/IP)
ULIA	UpLink Information Attribute
UME	UNI Management Entity
UMTS	Universal Mobile Telecommunications System
UNI	User-to-Network/Node Interface (Endgerät, Desktop)

UNIX	Uniplexed Information and Computing System
UNMA	Unified Network Management Architecture
UPC	Usage Parameter Control / User Policing Control
URC	Uniform Resource Citation (WWW)
URI	Universal Resource Identifier (WWW)
URL	Uniform/Universal Resource Locator (WWW)
URN	Uniform Resource Name (WWW)
USENET	USErs' NETwork; öffentliches Netz mit Knoten zum Internet, für News
USIM	UMTS Subscriber Identity Module
USTAT-PDU	Unsolicited Receiver State PDU
USV	Unterbrechungsfreie StromVersorgung
UTP	Unshielded Twisted Pair
UTRA	Universal Telecommunication Radio Access
UUS	User-to-User Signalling

V

VAP	Value Added Process (=NetWare Versionengruppe 2; vgl NLM)
VAR	Value Added Reseller (vgl OEM)
VAT	Visual Audio Tool
VBN	Visual Basic Network (= German Telekom Broadband Network)
VBNS	Very high speed Backbone Network Service
VBR	Variable Bit Rate (s. ABR, CBR, UBR)
VBS	Verteilte Betriebssysteme
VC	Virtual Circuit
VCC/I	Virtual Channel Connection/Identifier (=8 bits)
VCFC	Virtual Circuit Flow Control
VCL	Virtual Channel Link
VCR	Video Cassette Recorder
VF	Variance Factor
VHE	Virtual Home Environment
VIC	VIdeo Conferencing
VLAN	Virtual LAN
VLSI	Very Large Scale Integration
VoD	Video on Demand
VOFDM	Vector Orthogonal Frequency Division Multiplexing (Daten-, Sprach- u. Videokommunikation per Funk)
VOP	Video Object Plane
VPC/I	Virtual Path Connection/Identifier (=16 bits)
VPL	Virtual Path Link
VPML	Virtual Reality Modeling Language
VPN	Virtual Private Network
VPT	Virtual Path Terminator (UNI 3.0)
VRML	Virtual Reality Modeling Language
VRRP	Virtual Router Redundancy Protocol
VSAT	Very Small Aperture Terminal
VTOA	Voice & Telephony Over ATM
VTP	VLAN Trunk Protocol (Cisco)

W

WAIS	Wide Area Information Server

WAN	Wide Area Network
WAP	Wireless Application /Access Protocol
WBEM	Web Based Enterprise Management
WDM	Wavelength Division Multiplexing
WFQ	Weighted Fair Queuing
WIN	WIssenschaftsNetz
WINS	Windows Internet Name Service
WORM	Write Once Read Many
WRED	Weighted Random Early Detection (Cisco)
WRR	Weighted Round Robin
WWW	World Wide Web

X

X	CCITT TMN: Schnittstelle zu anderen Managementsystemen
XDR	eXternal Data Representation
XMP	X/open Management Protocol (Nachrichtenaustauschprotokolle)
XNS	Xerox Network Systems
XPG	X/open Portability Guide
XOM	X/open OSI-abstract data Manipulation

APPENDIX C

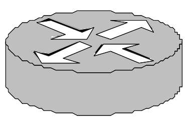
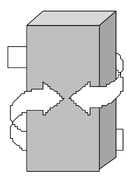
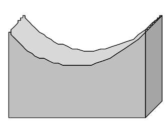
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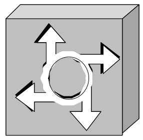
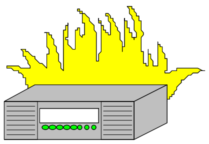
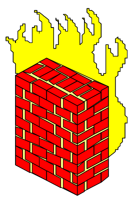
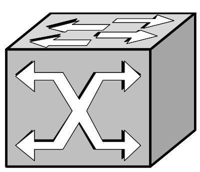
APPENDIX D

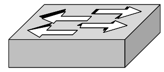
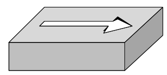
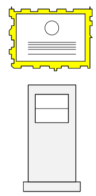
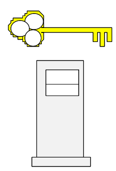
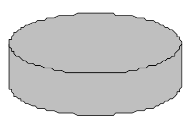
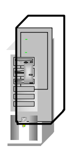
STANDARD LOGICAL DIAGRAM SYMBOLS

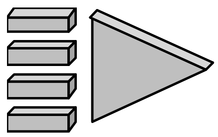
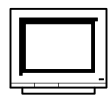
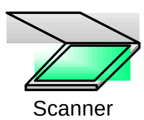
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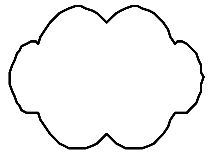
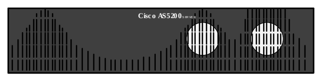
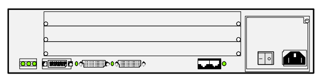
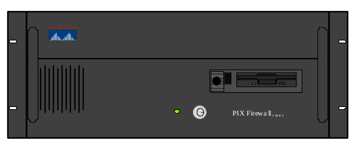
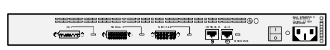
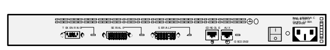
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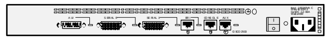
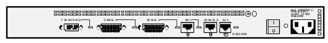
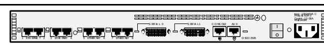
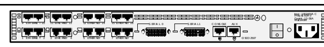
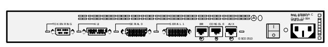
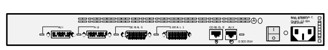
Device	Symbol	Required Information
1.0 Router		Identify all interfaces as Serial or Ethernet, including fast Ethernet or Gigabit i.e., **s** and **e**
2.0 Gateway		Identify input protocol(s) and output(s) protocol as well as associated speeds.
3.0 Bridge		Identify remote (**R**) or local (**L**) and link speeds. Indicate if any compression is employed.

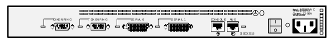
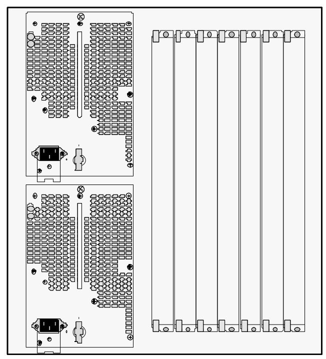
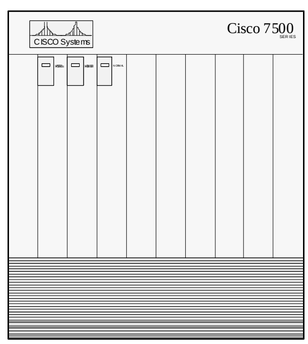
4.0 Communications Server		Identify communication connections and channels availability. (PRI or racked modems)
5.0 Appliance Firewall		Identify make and model (Cisco PIX or NOKIA). Indicate network segments including DMZ(s) and Service Network(s).
6.0 Firewall		Indicate system (SUN, HP, IBM), Operating System (UNIX, NT) and Firewall Software (Checkpoint, AXENT, etc.) Indicate network segments including DMZ(s) and Service Network(s).
7.0 Main Switch		Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.

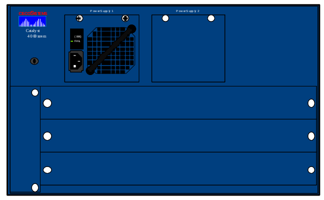
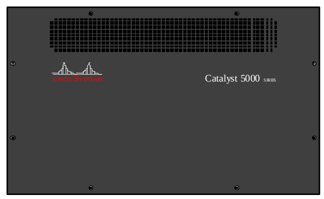
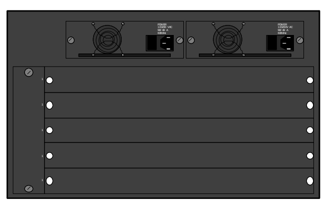
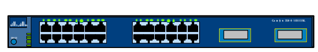
8.0 Workgroup Switch (fan-out)		Indicate model, number of ports required, speed of ports (including uplink ports) and if SNMP or RMON management is included.
9.0 Hub		Indicate model, number of ports required, Hub speed (10 or 100 Mbps), presence and speed of uplink ports, and if SNMP or RMON management is included.
10.0 Certificate Server		Indicate make and model, number of certificates supported and network connection speed required.
11.0 PKI Server		Indicate make and model, number of tokens supported and network connection speed required.
12.0 Database		Indicate type and vendor (SQL by Oracle, SQL by Microsoft, Flatfile by IBM); and approximate size.
13.0 Server		Indicate make, model, and configuration.

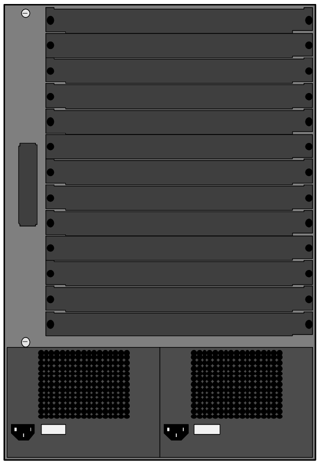
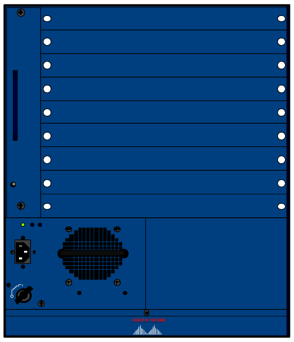
14.0 Workstation		Indicate make, model, and configuration.
15.0 Terminal Server		Indicate number of terminals supported and interface configuration.
16.0 Terminal		Indicate make, model, and configuration.
17.0 Scanner		Indicate make, model, and configuration (memory and network capability).
18.0 Printer		Indicate make, model, and configuration (memory and network capability).

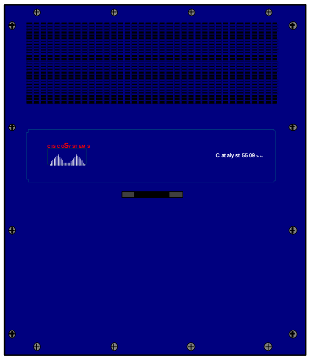
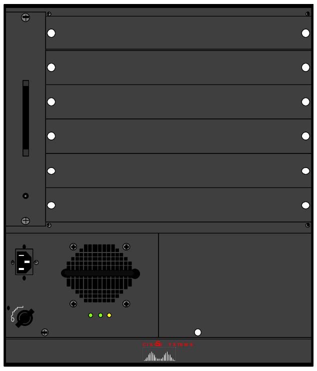
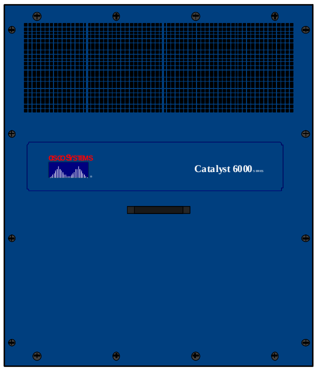
19.0 Network Cloud		Indicate cloud or interface provider (Sprint, MCI, AT&T) and interface speeds.
20.0 Access Server	 Cisco Systems AS5200 (F)	Indicate make and model, number of PRI lines supported and network connection speed required.
21.0 Access Server	 Cisco Systems AS5200 (R)	Indicate make and model, number of PRI lines supported and network connection speed required.
22.0 Firewall	 Cisco Systems PIX Firewall	Indicate network segments including DMZ(s) and Service Network(s).
23.0 Router	 Cisco Systems 2501	Indicate IP numbers and serial service.
24.0 Router	 Cisco Systems 2502	Indicate IP numbers and serial service.

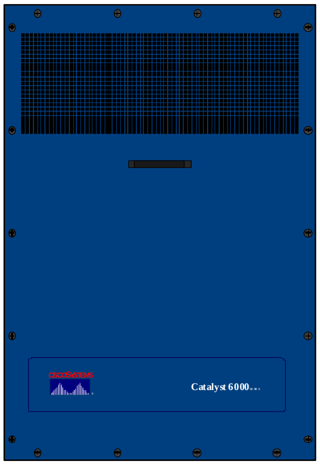
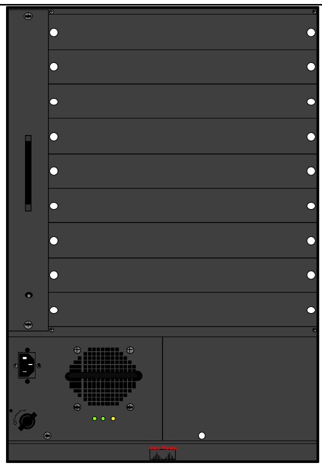
25.0 Router	 Cisco Systems 2503	Indicate IP numbers and serial service.
26.0 Router	 Cisco Systems 2504	Indicate IP numbers and serial service.
27.0 Router	 Cisco Systems 2505	Indicate IP numbers and serial service.
28.0 Router	 Cisco Systems 2507	Indicate IP numbers and serial service.
29.0 Router	 Cisco Systems 2513	Indicate IP numbers and serial service.
30.0 Router	 Cisco Systems 2514	Indicate IP numbers and serial service.

31.0 Router	 Cisco Systems 2515	Indicate IP numbers and serial service.
32.0 Router	 Cisco Systems 7507 (R)	Indicate IP numbers and serial service.
33.0 Router	 Cisco Systems 7507 (F)	Indicate IP numbers and serial service.

34.0 Router	 Cisco Systems 4000 (R)	Indicate IP numbers and serial service
35.0 Switch	 Cisco Systems Catalyst 5000 (F)	Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.
36.0 Switch	 Cisco Systems Catalyst 5000 (R)	Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.
37.0 Switch	 Cisco Systems WS-C3524-XL	Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.

38.0 Switch	 Cisco Systems Catalyst 5500 (R)	Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.
39.0 Switch	 Cisco Systems Catalyst 5500 (F)	Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.
40.0 Switch	 Cisco Systems Catalyst 5509 (R)	Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.

41.0 Switch	 Cisco Systems Catalyst 5509 (F)	Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.
42.0 Switch	 Cisco Systems Catalyst 6006 (R)	Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.
43.0 Switch	 Cisco Systems Catalyst 6006 (F)	Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.

44.0 Switch	Cisco Systems Catalyst 6009 (F)	Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.
45.0 Switch	Cisco Systems Catalyst 6009 (R)	Indicate model, number of ports required, type and speed of ports i.e., 100 Mbps ST fiber (including uplink ports) and if SNMP or RMON management is included.
46.0 Switch	Cisco Systems Catalyst 1900	No special information Required.

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Note:
To be developed upon completion of manual.